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# The A. & M. College of Texas

DEPARTMENT OF OCEANOGRAPHY

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DOCUMENT
COLLECTION

## SUMMARY OF NORTH PACIFIC WEATHER STATION BATHYTHERMOGRAPH DATA

1943 - 1952

Office of Naval Research
Contract N7 onr-487 T.O. 3
Geophysics Branch

Navy Department
Project NR 083-061
Technical Report No. 7

Dale F. Leipper and Project Staff

January, 1954

Research Conducted for the

Texas A. & M. Research Foundation

COLLEGE STATION, TEXAS

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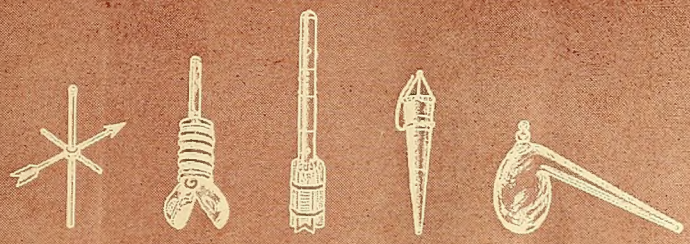

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The Agricultural and Mechanical College of Texas
Department of Oceanography
College Station, Texas

Texas A and M Research Foundation
Project 29

# SUMMARY OF NORTH PACIFIC WEATHER STATION BATHYTHERMOGRAPH DATA 1943-1952

(Technical Report No. 7)

Project 29 is a study of the atmospheric influence on the thermal structure of the oceans sponsored by the Office of Naval Research (Project NR 083-061, Contract N7onr-487, Task Order 3).

January, 1954

Dale F. Leipper
and
Project Staff

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## LIST OF FIGURES

Figure 1. Location of North Pacific Weather Stations

Figures 2,5,8,11,....,62. Depth of Mixed Layer and of Water 2°F Colder Than the Mixed Layer

Figures 3,6,9,12,....,63. Temperatures at Selected Depths

Figures 4,7,10,13,...,64. Depths to Selected Differences from Sea Surface Temperature

***

| Figures | Location | Date |
|---|---|---|
| 2,3,4 | 50°00'N, 145°00'W | July 1949 - June 1950 |
| 5,6,7 | 50°00'N, 145°00'W | July 1950 - June 1951 |
| 8,9,10 | 49°00'N, 148°00'W | July 1948 - June 1949 |
| 11,12,13 | 49°00'N, 148°00'W | July 1949 - June 1950 |
| 14,15,16 | 48°00'N, 162°00'E | July 1950 - June 1951 |
| 17,18,19 | 48°00'N, 162°00'E | July 1951 - June 1952 |
| 20,21,22 | 40°00'N, 150°00'W | July 1943 - June 1944 |
| 23,24,25 | 40°00'N, 150°00'W | July 1944 - June 1945 |
| 26,27,28 | 40°00'N, 142°00'W | July 1949 - June 1950 |
| 29,30,31 | 38°00'N, 158°00'W | July 1946 - June 1947 |
| 32,33,34 | 33°00'N, 135°00'W | July 1950 - June 1951 |
| 35,36,37 | 33°00'N, 135°00'W | July 1951 - June 1952 |
| 38,39,40 | 31°00'N, 164°00'E | July 1951 - June 1952 |
| 41,42,43 | 30°00'N, 140°00'W | July 1946 - June 1947 |
| 44,45,46 | 30°00'N, 140°00'W | July 1947 - June 1948 |
| 47,48,49 | 30°00'N, 140°00'W | July 1948 - June 1949 |
| 50,51,52 | 30°00'N, 140°00'W | July 1949 - June 1950 |
| 53,54,55 | 28°00'N, 145°00'W | July 1950 - June 1951 |
| 56,57,58 | 28°00'N, 145°00'W | July 1951 - June 1952 |
| 59,60,61 | 25°41'N, 149°00'W | July 1945 - June 1946 |
| 62,63,64 | 12°45'N, 180°00' | July 1945 - June 1946 |

***

# INTRODUCTION

The information in this report was obtained from BT (bathythermograph) data collected at or near (within a radius of nine miles) the assigned positions of North Pacific Weather Ships. The observations are on file at the Scripps Institution of Oceanography and were loaned to Texas A. & M. for this study. The methods of handling these data were given in detail in Technical Report No. 1 of this project, Some Methods Used in Representing Bathythermograph Data, but will be restated briefly here.

For each year in which there are sufficient data at a given station to warrant this type of study, three time graphs have been drawn. These are:

1) Depth of mixed layer and of water $2^{o}F$ colder than the mixed layer;
2) Temperature at selected depths; and
3) Depths of selected differences from sea surface temperature.

To obtain these time graphs of BT data, a procedure involving four separate steps was employed:

1. Selection of cards. Only one card was used to represent a particular day. This card was one selected as being typical for that day, factors considered being sea surface temperature, depth of mixed layer, depth and nature of the thermocline, time of observation and general character of the curve. When possible, the observation made nearest to 2100 hours (GCT) was chosen.

2. Reading of cards. A team of two people was used for all card reading, each reading being checked to assure accuracy. Temperatures at ten chosen depths (0,30,50,75,100,150,200,250,350 and 450 feet) were read, with an agreement between readers of $\pm 0.1^{o}F$ being required for each depth. The depth of the mixed layer (this depth being defined as the depth to a $\pm 0.3^{o}F$ change from the temperature of the sea surface) and the depth of water $2^{o}F$ colder than the mixed layer were read, the required agreement in these cases being $\pm 3$ feet. Finally the depths of selected differences from sea surface temperature were read, agreement again being $\pm 3$ feet.

3. Smoothing of data. A running five-day average was determined to make a picture showing the nature of gradual changes with time. The value for a particular day was obtained by averaging the value for that day with the two immediately preceeding and the two following days. Exceptions occurred at the beginning or end of a series of days or at places where for one or two days there were no data available. In these cases four-day or, in a few cases, three-day averages were used. It should be noted that all curves are five-day running mean curves.

4. Plotting of data. The final step consisted of plotting the data in the form which appears in this report. It should be noted that only the values for the surface, 100, 200 and 350 foot depths have been plotted for temperatures at selected depths. In those cases where isothermal conditions exist, only the temperature for the lowest depth has been plotted. Thus when the curve for a particular

depth does not appear on the graph, the temperature at this depth is the same as the temperature of the next lower curve which does appear. On all graphs the days for which no observations were available are indicated as are the days on which shallow (150 foot) bathythermographs were used.

The years for which data for the various weather stations have been plotted and reproduced in this report appear in the List of Figures, page ii. Stations for which data were received but not plotted are listed in the Legend for Figure 1.

Data in this report appear only in the final plotted form. However, copies of the data in both unsmoothed and smoothed preliminary form are on file in the Department of Oceanography.

In addition to the project supervisor, Dr. Dale F. Leipper, the following people took part in the work: Richard M. Adams worked out the detailed procedure. Mrs. Jeanneane L. Cline, Mrs. Merle A. Cobb and Mrs. Jeanne Burja drafted the charts. Talmage Y. Hicks, Thomas G. Roetzel, Albert B. Turner, Ernest A. Prochaska, Edward Ruhnke, Melvin L. Pierce, John A. Rosenquest, Van Rudolph Cammack, Mrs. Ella Frances Spears, Mrs. Marilyn C. Johnson and Mrs. Jeanneane L. Cline read BT cards and processed the data. Jeanneane L. Cline was in charge of the organization and reproduction of this report

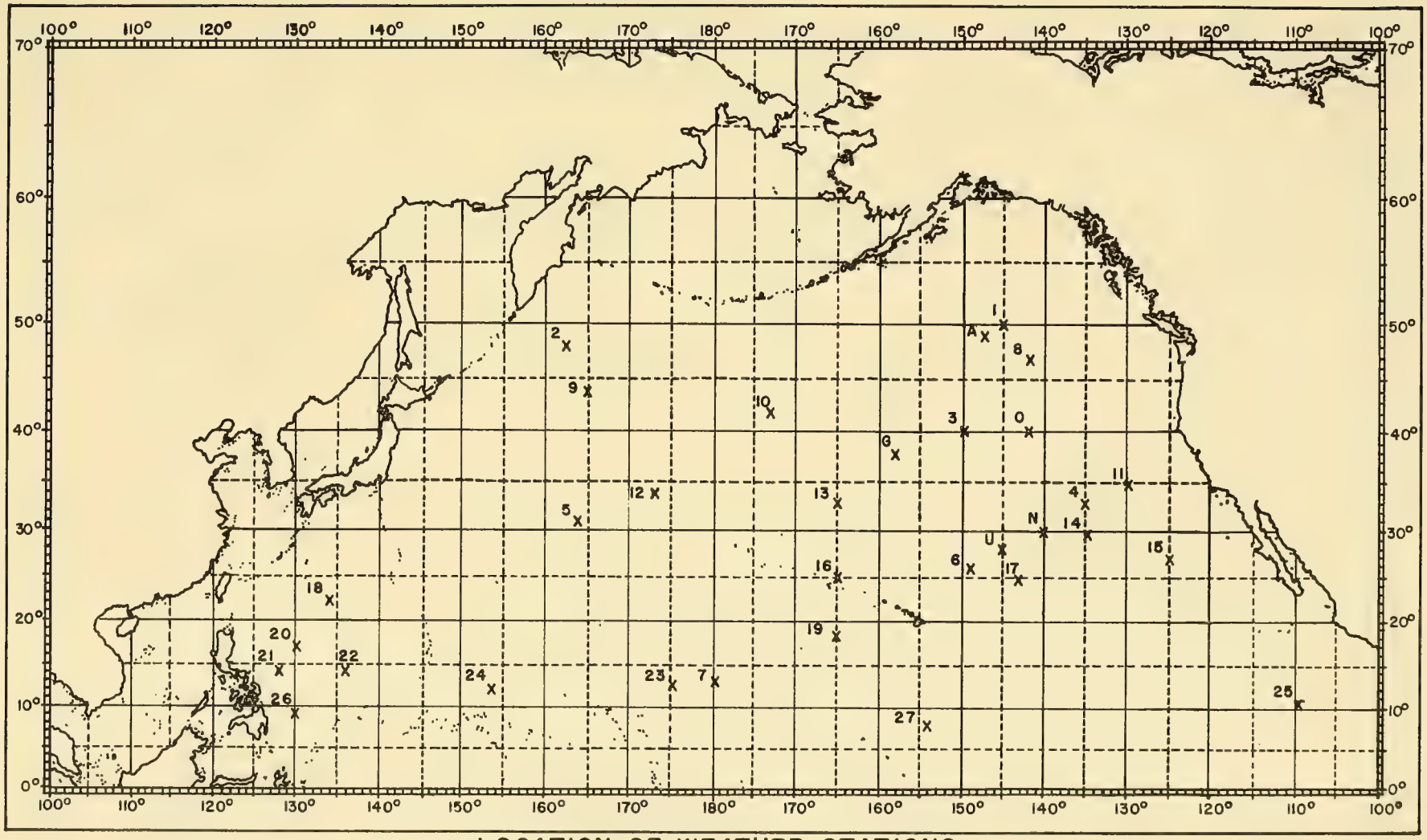
A similar report containing North Atlantic BT data was published by this project as Technical Report No. 3, Summary of North Atlantic Weather Station Bathythermograph Data 1946-1950, in September 1952.

## LEGEND FOR FIGURE 1

| Designation | Location |
|---|---|
| 1 | 50°00'N, 145°00'W |
| A | 49°00'N, 148°00'W |
| 2 | 48°00'N, 162°00'E |
| 3 | 40°00'N, 150°00'W |
| O | 40°00'N, 142°00'W |
| G | 38°00'N, 158°00'W |
| 4 | 33°00'N, 135°00'W |
| 5 | 31°00'N, 164°00'E |
| N | 30°00'N, 140°00'W |
| U | 28°00'N, 145°00'W |
| 6 | 25°41'N, 149°00'W |
| 7 | 12°45'N, 180°00' |

Stations 1 through 7 (including those with letter designations) have data in the final drafted form. BT cards were received for the following stations, but they were either outside the nine mile limit or there was not a sufficient amount of data to merit final processing, however the data is on file in a preliminary form:

| | |
|---|---|
| 8 | 47°00'N, 142°00'W |
| 9 | 44°00'N, 165°00'E |
| 10 | 42°00'N, 173°00'W |
| 11 | 34°45'N, 129°49'W |
| 12 | 34°00'N, 173°00'E |
| 13 | 33°00'N, 165°00'W |
| 14 | 29°40'N, 134°50'W |
| 15 | 27°00'N, 125°00'W |
| 16 | 25°00'N, 165°00'W |
| 17 | 24°40'N, 142°50'W |
| 18 | 22°00'N, 134°00'E |
| 19 | 18°20'N, 165°00'W |
| 20 | 17°00'N, 130°00'E |
| 21 | 14°00'N, 128°00'E |
| 22 | 14°00'N, 136°00'E |
| 23 | 12°20'N, 175°30'E |
| 24 | 11°55'N, 153°40'E |
| 25 | 10°18'N, 109°13'W |
| 26 | 09°00'N, 130°00'E |
| 27 | 08°00'N, 154°00'W |




LOCATION OF WEATHER STATIONS

FIGURE I

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

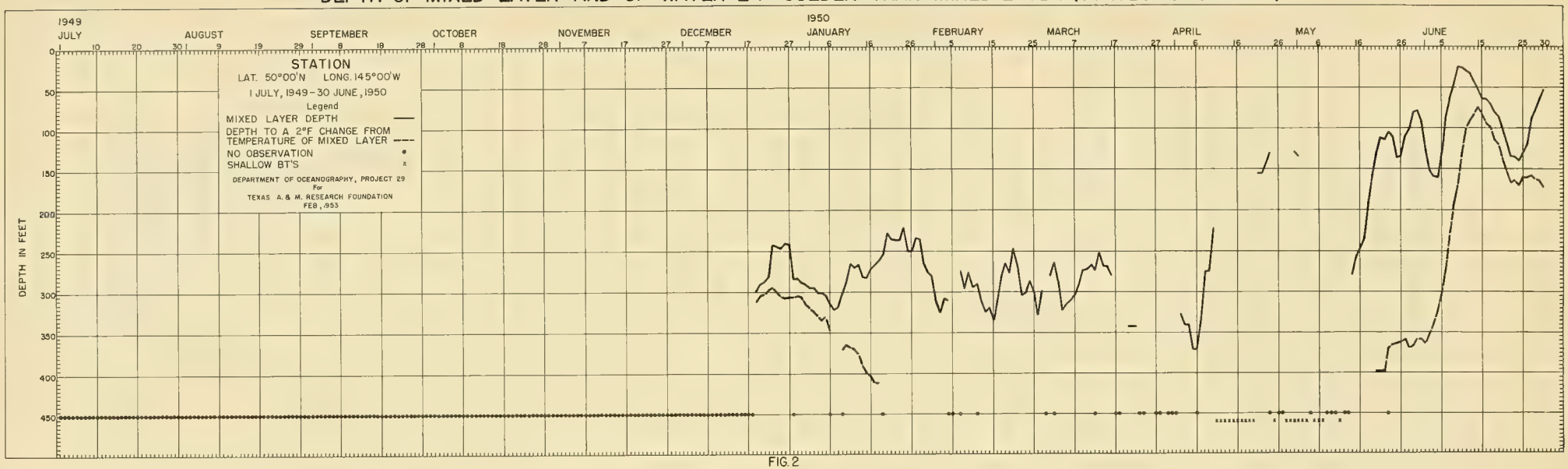



FIG. 2

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

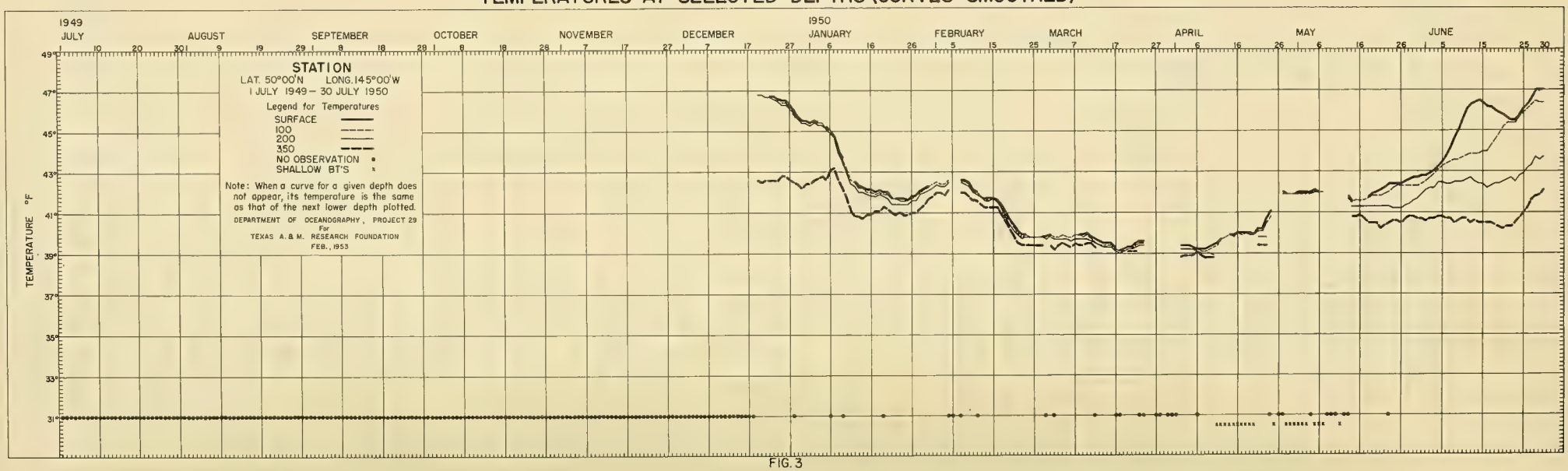



FIG. 3

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

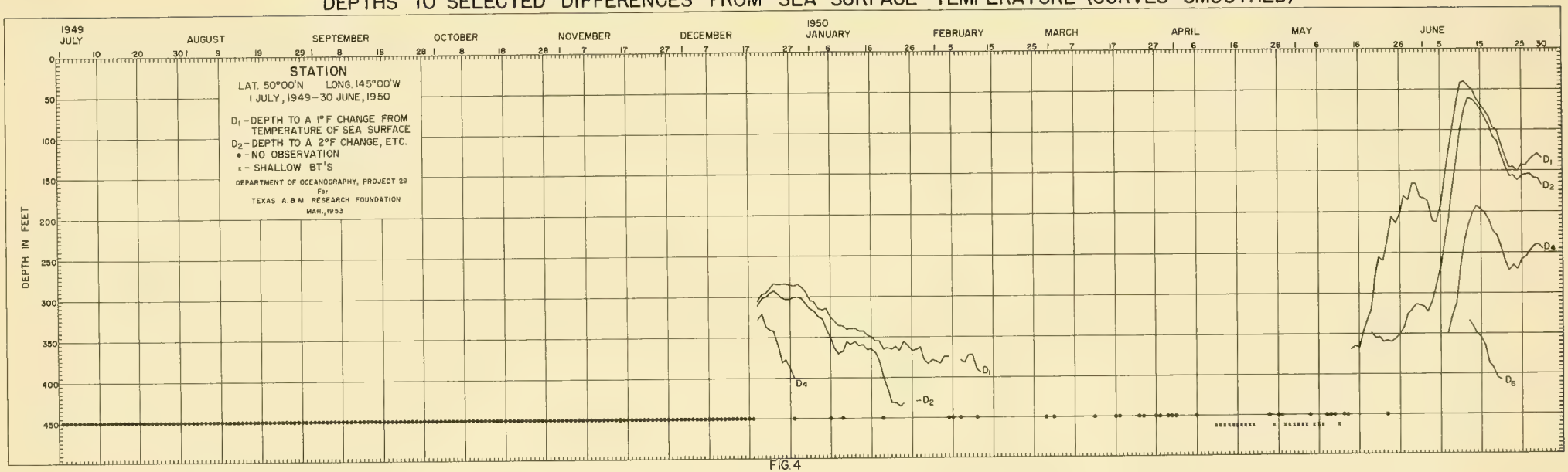



FIG. 4

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

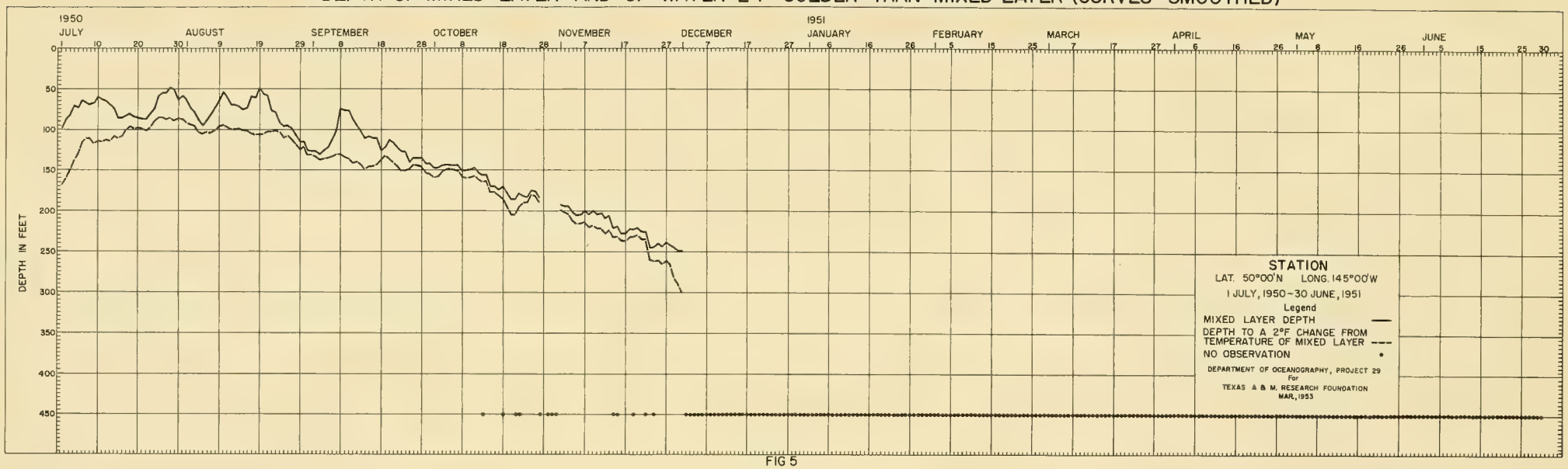



FIG 5

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

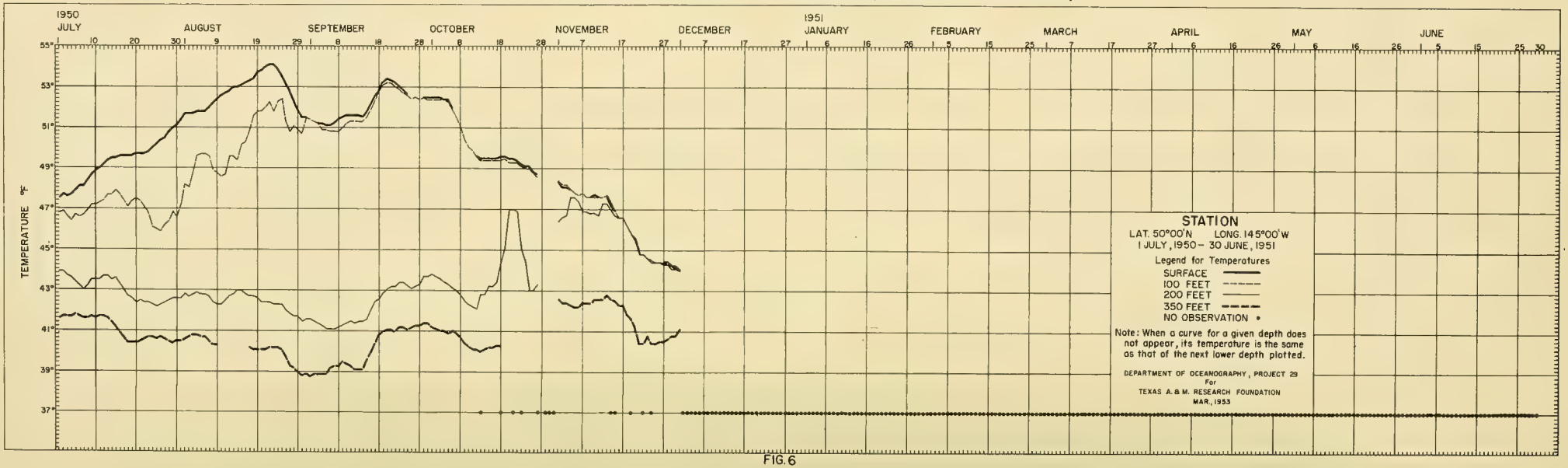



FIG. 6

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

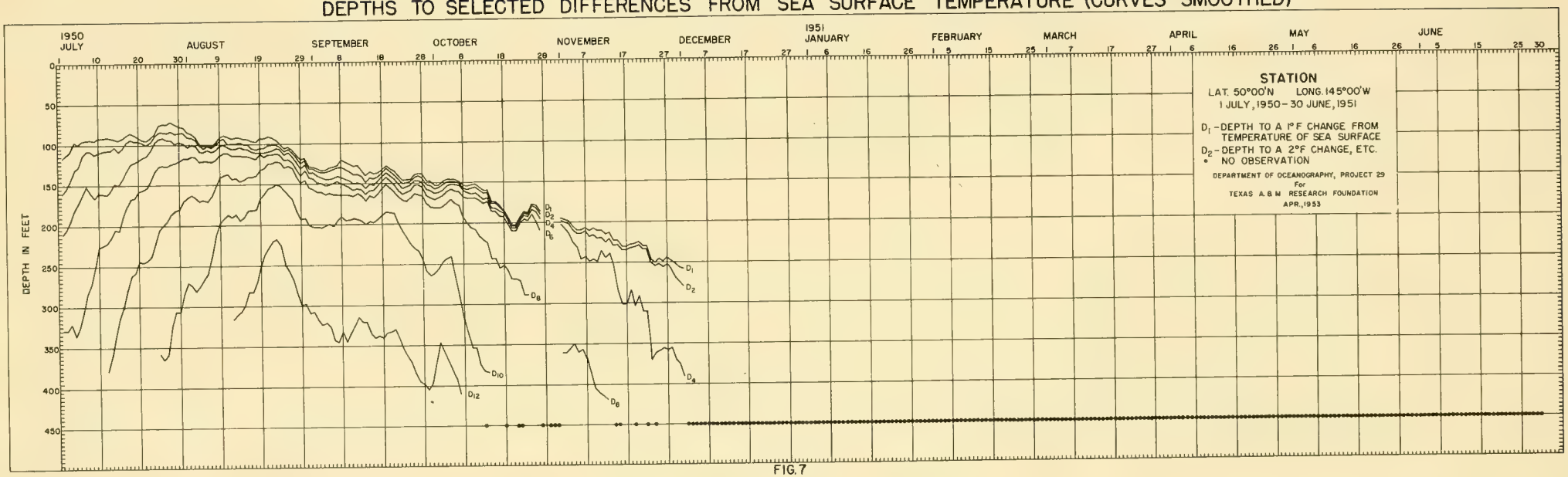



FIG. 7

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

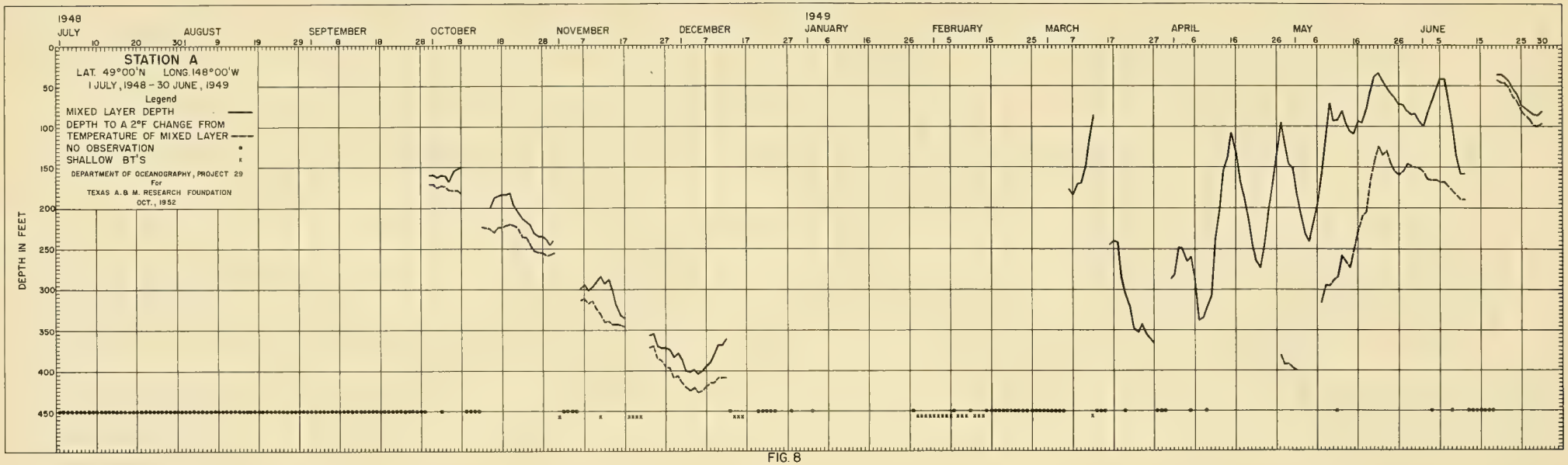



FIG. 8

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

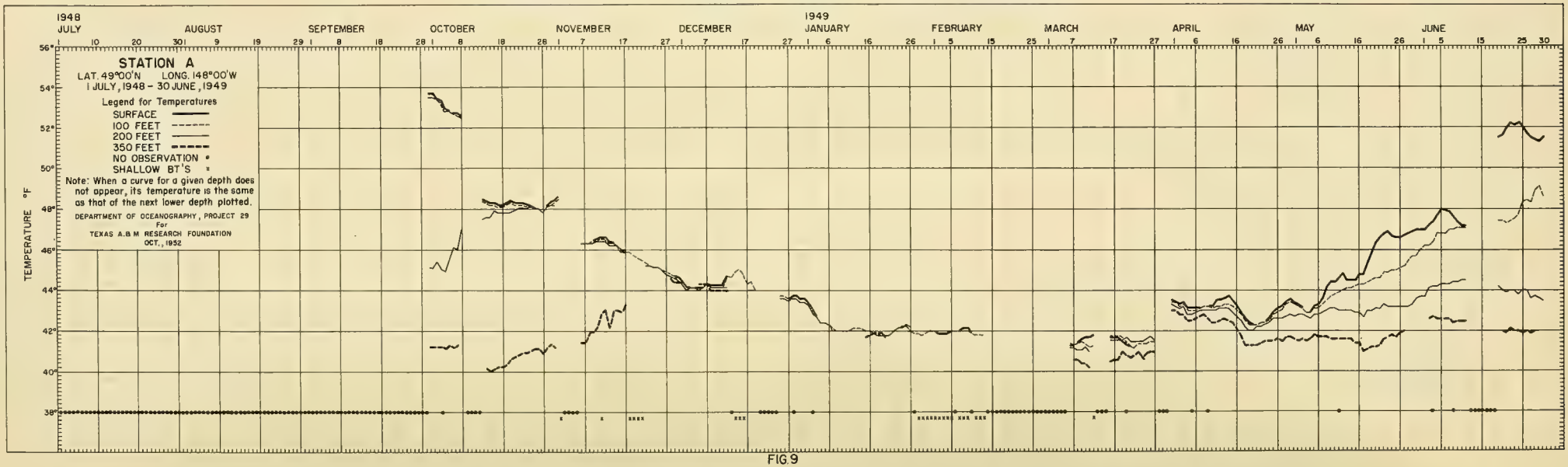



FIG. 9

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

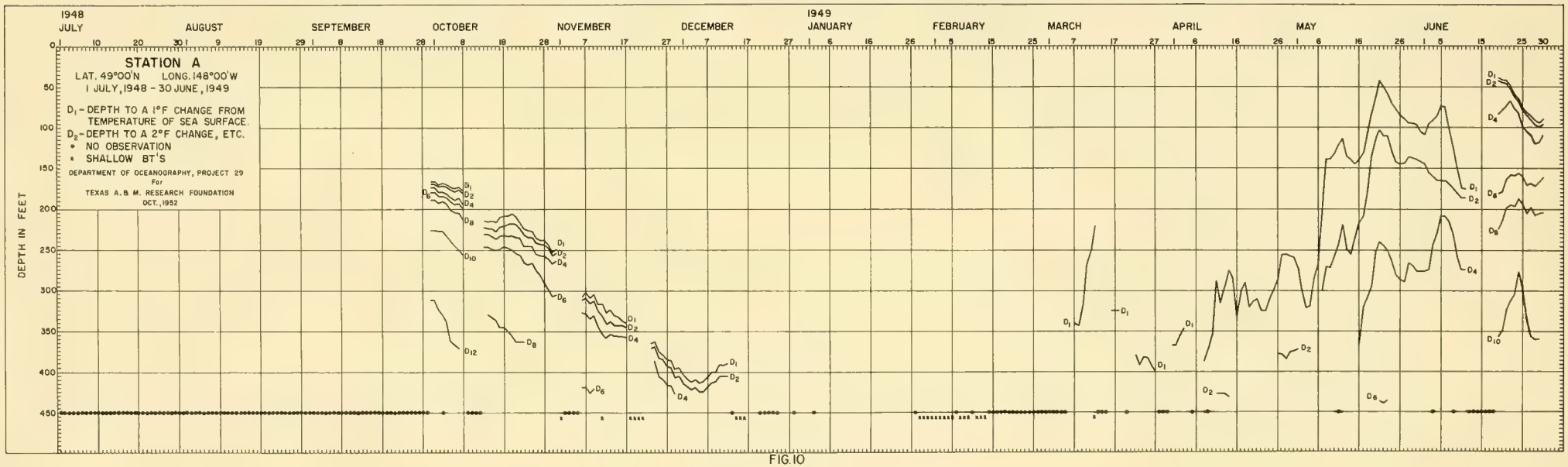



FIG. 10

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

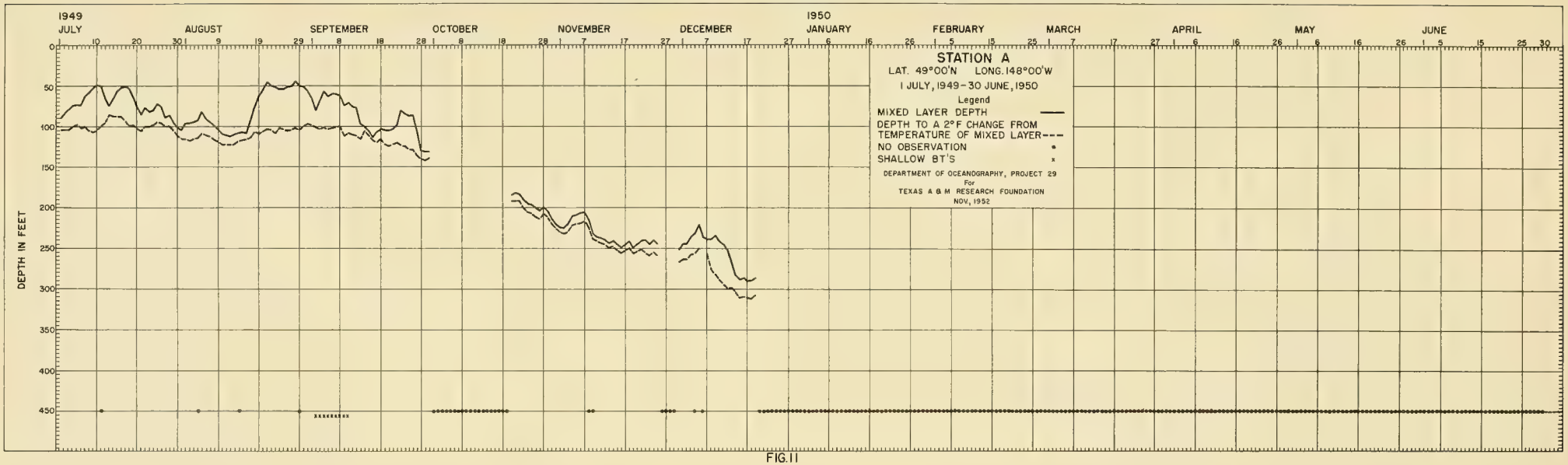



FIG. 11

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

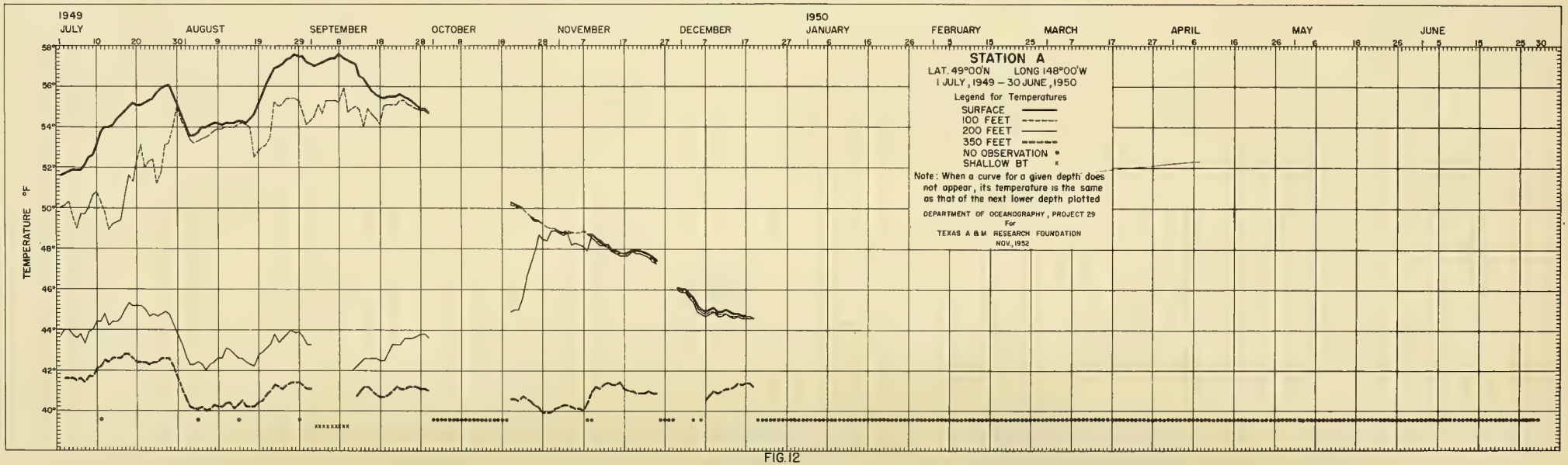



FIG. 12

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

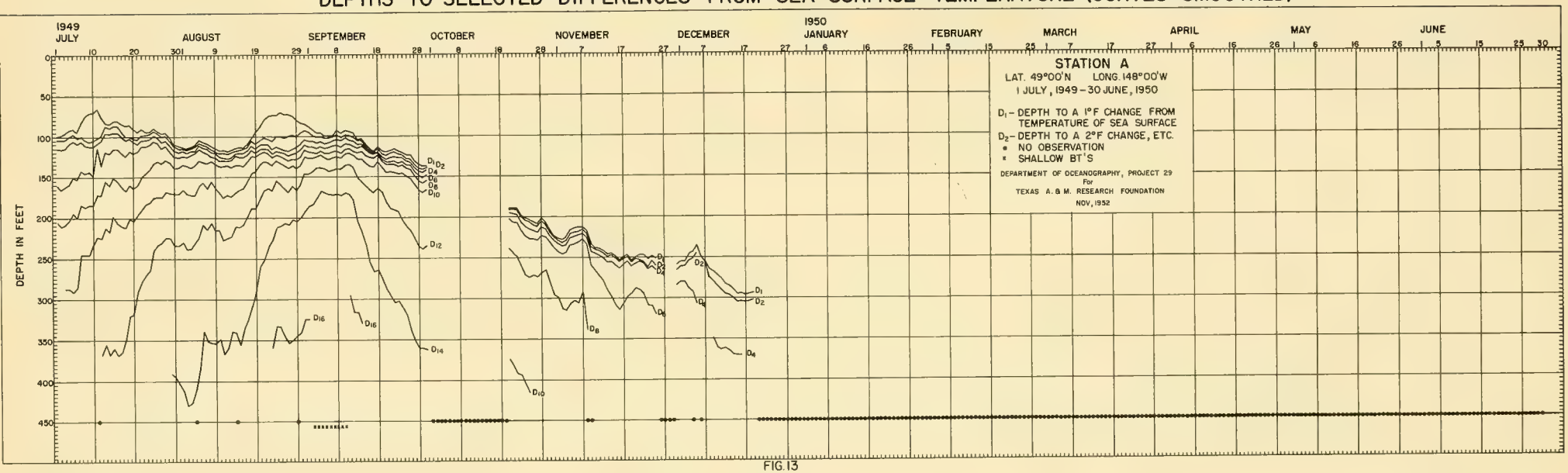



FIG. 13

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

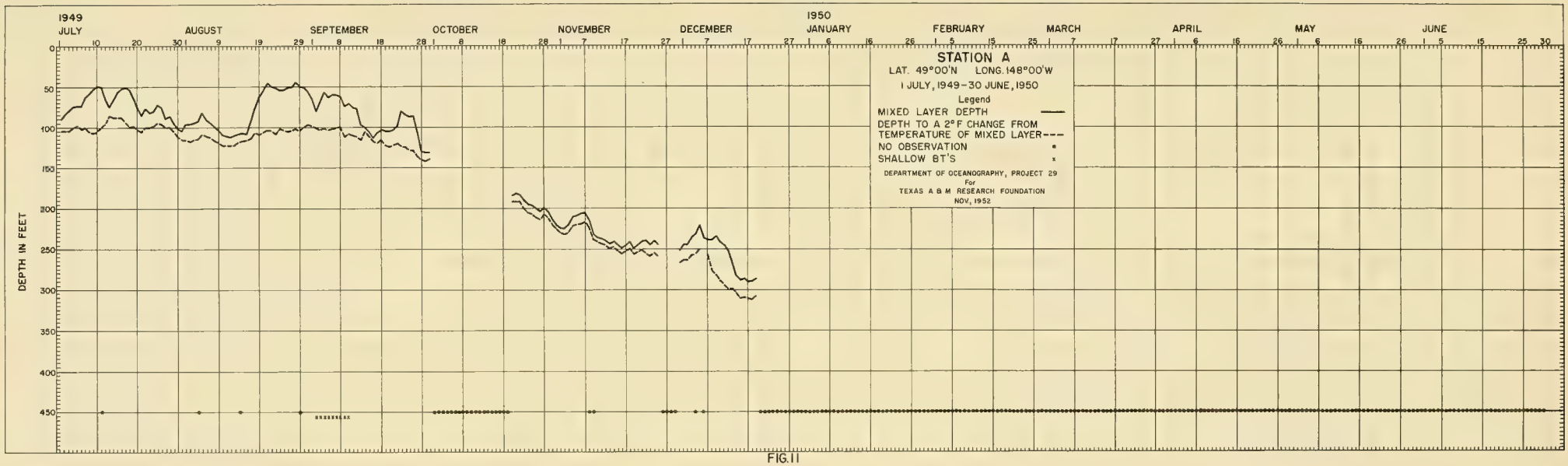



FIG. 11

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

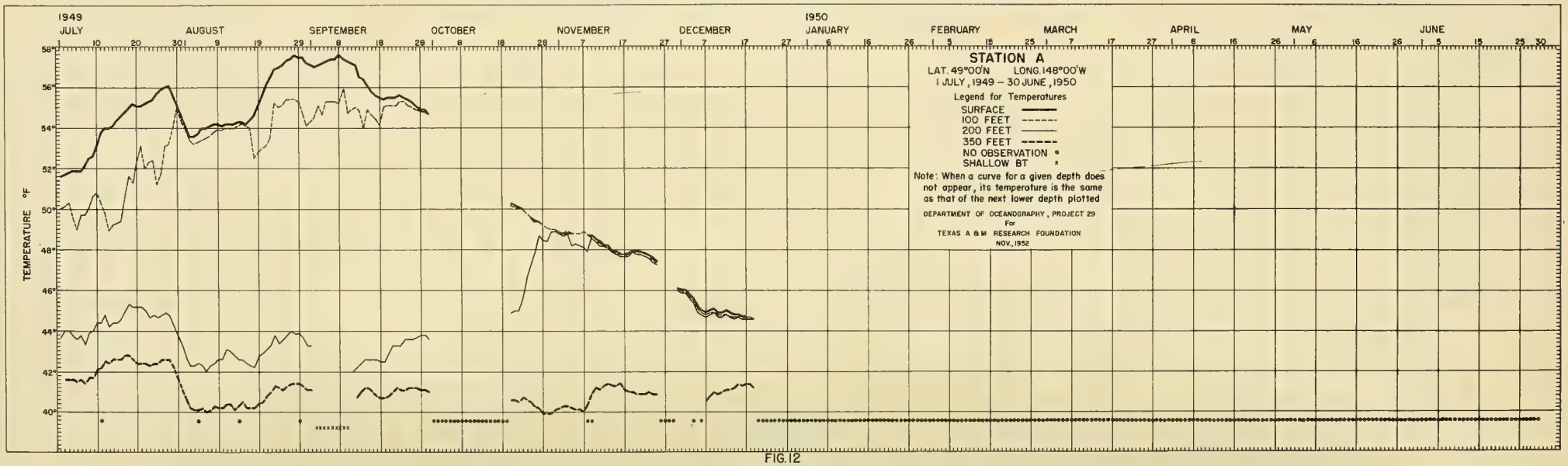



FIG. 12

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

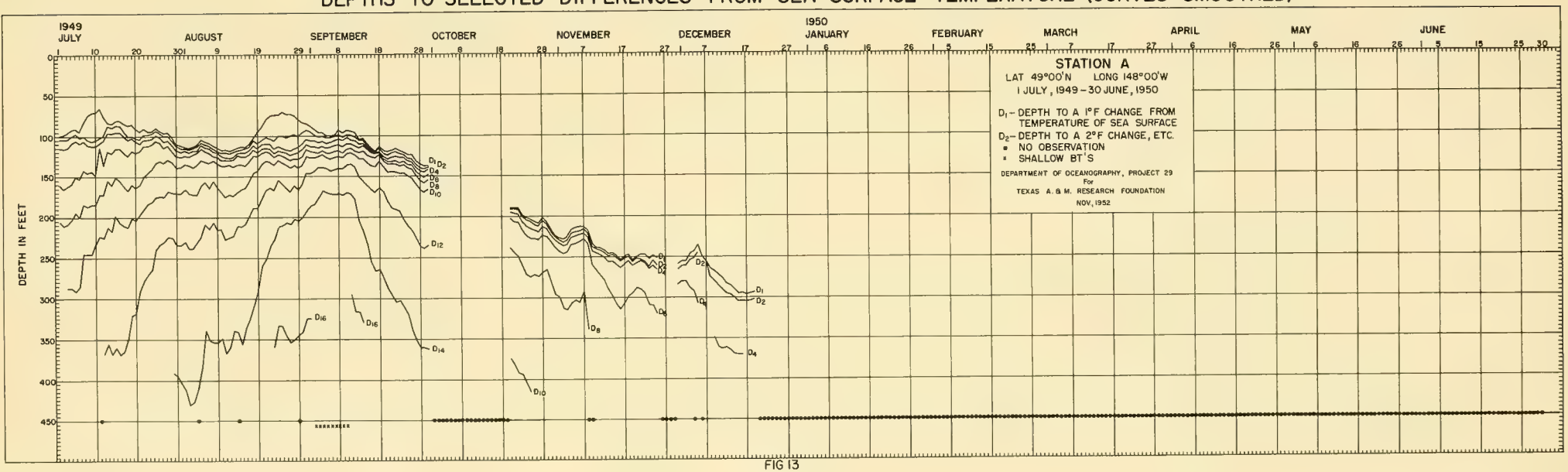



FIG 13

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

FIG. 14

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

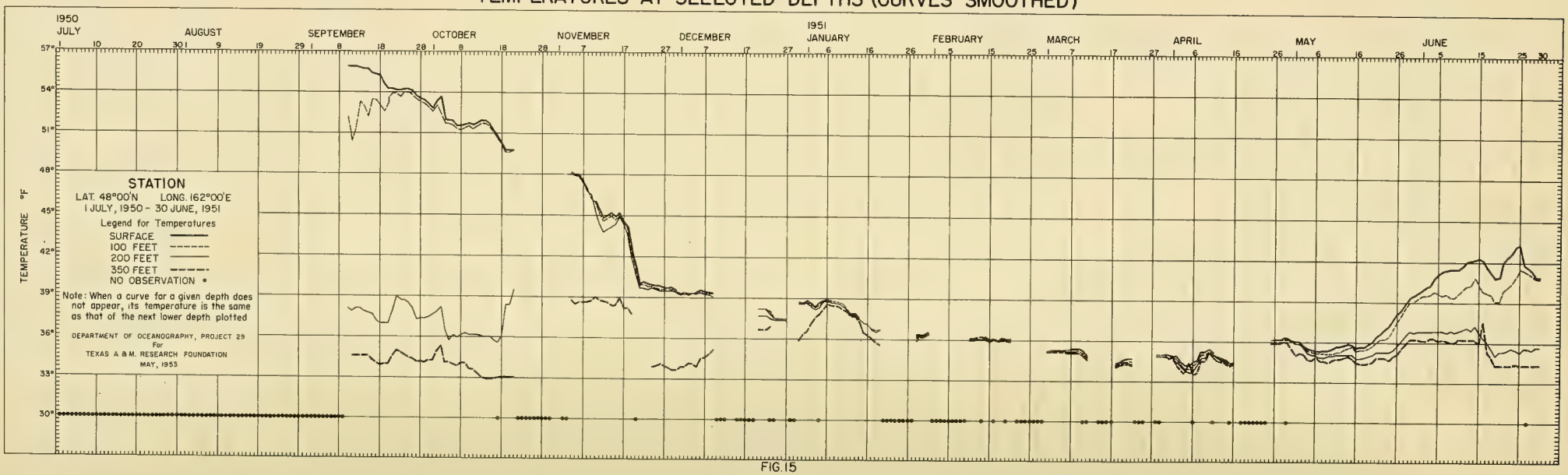



FIG. 15

DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

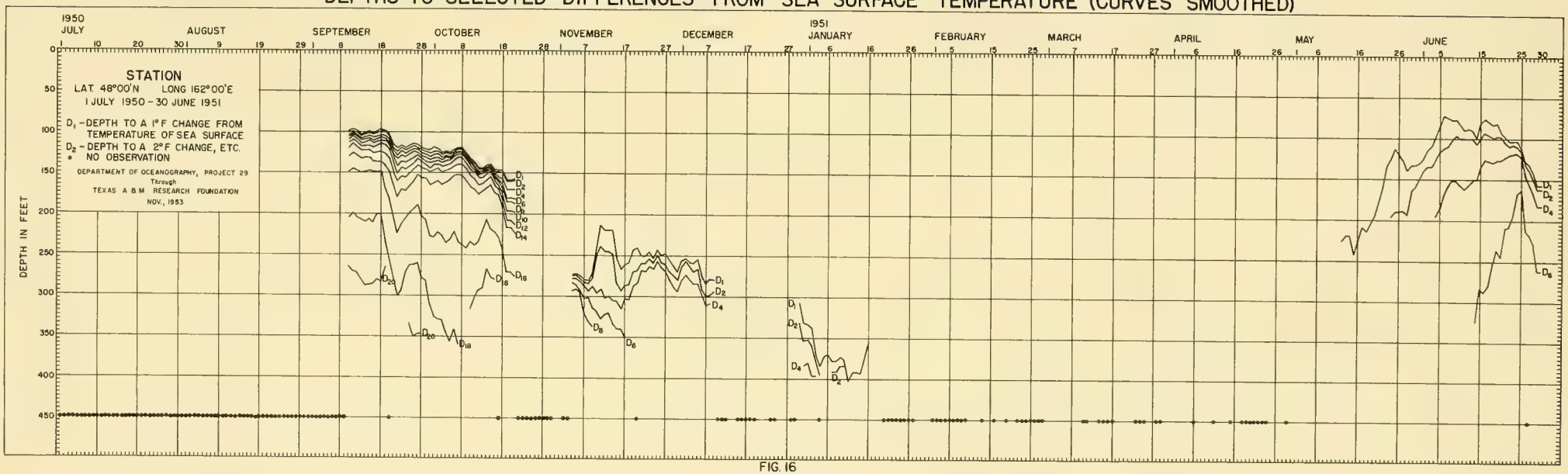



FIG. 16

## DEPTH OF MIXED LAYER AND OF WATER 2° F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

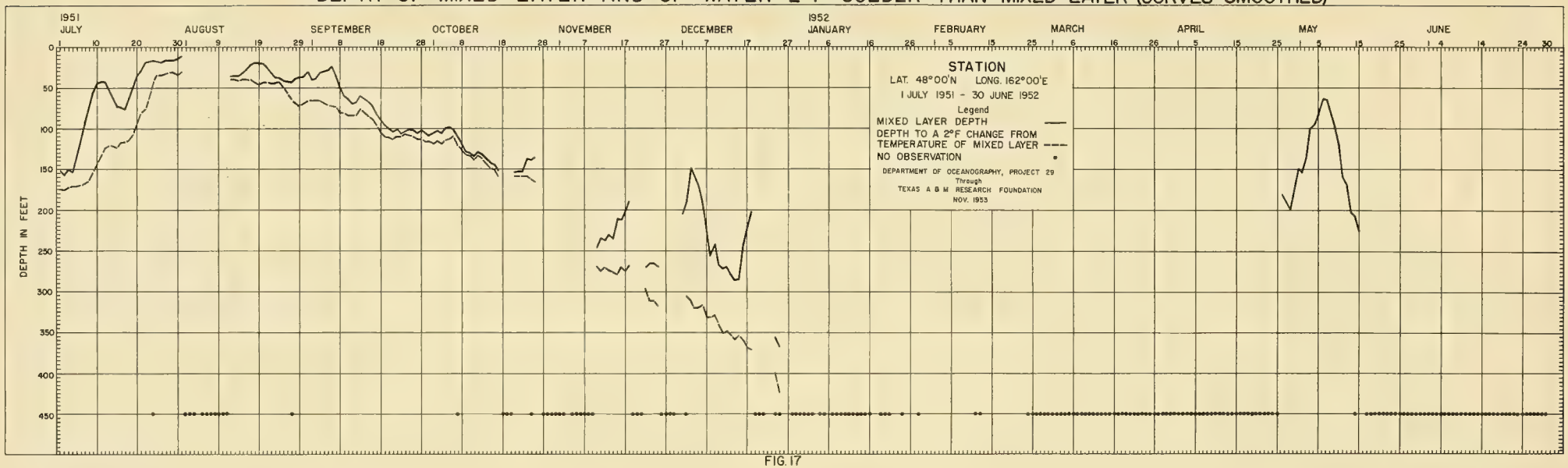



FIG. 17

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

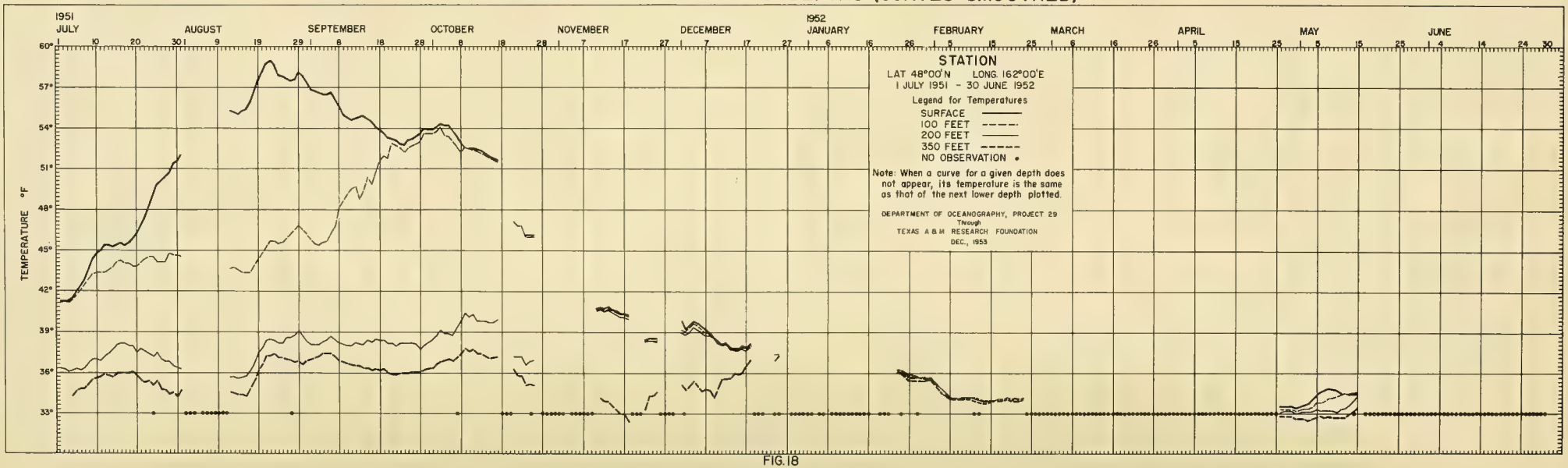



FIG. 18

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

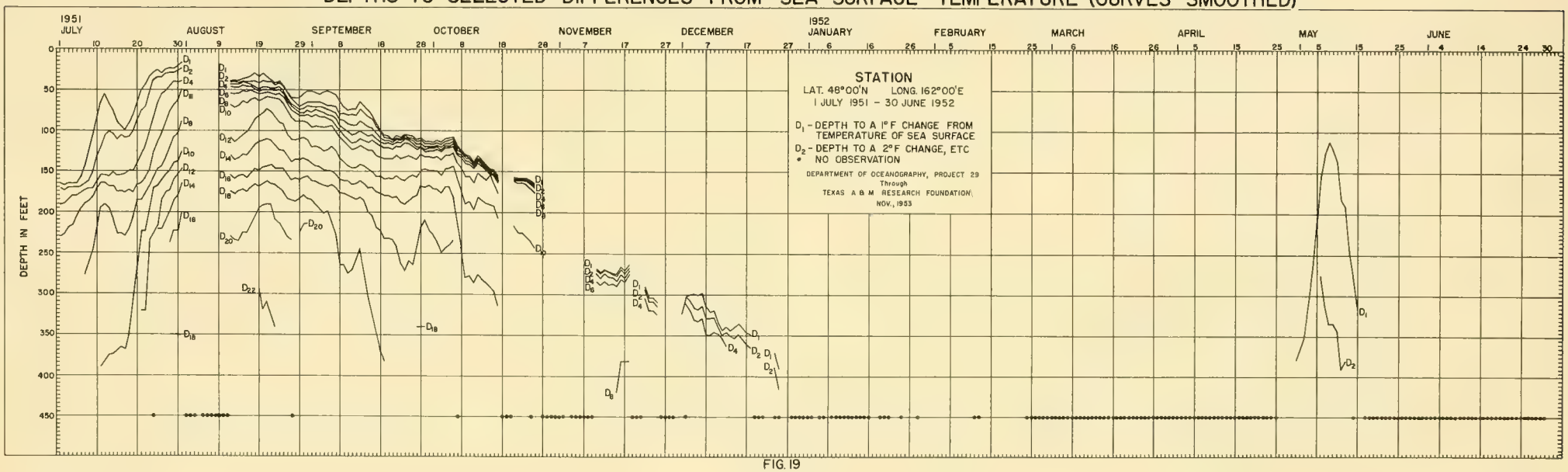



FIG. 19

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

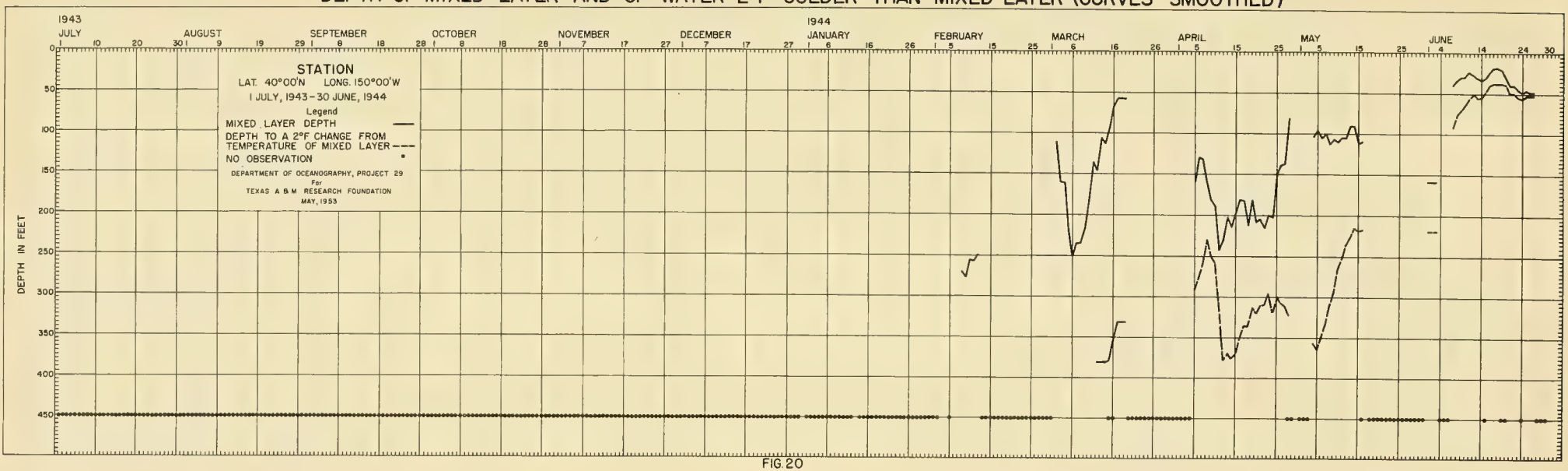



FIG. 20

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

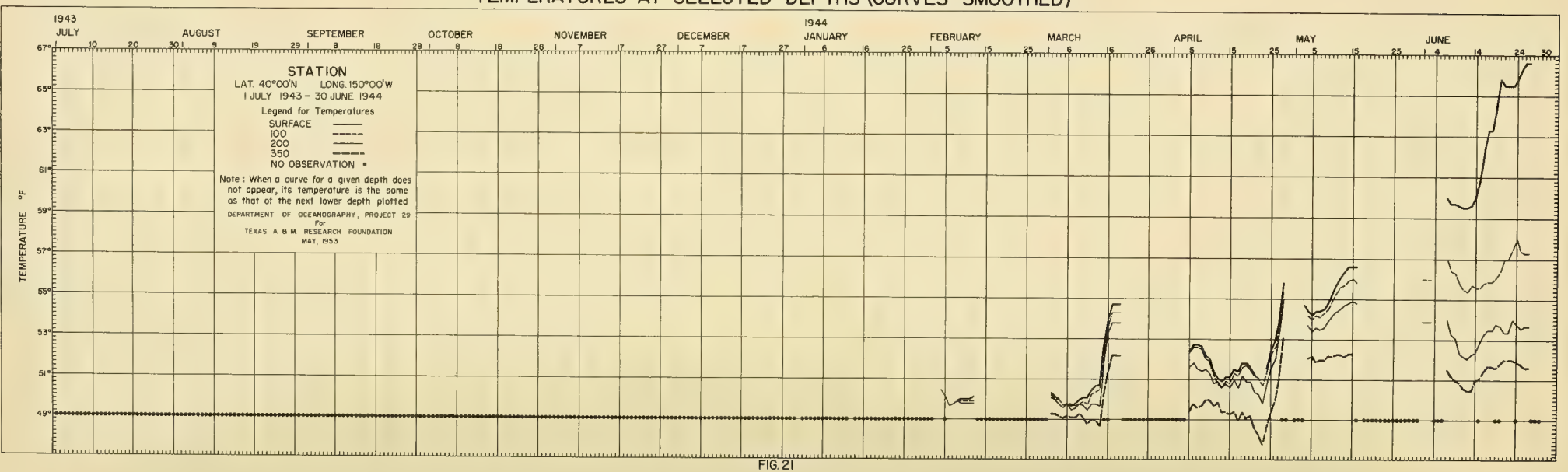



FIG. 21

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

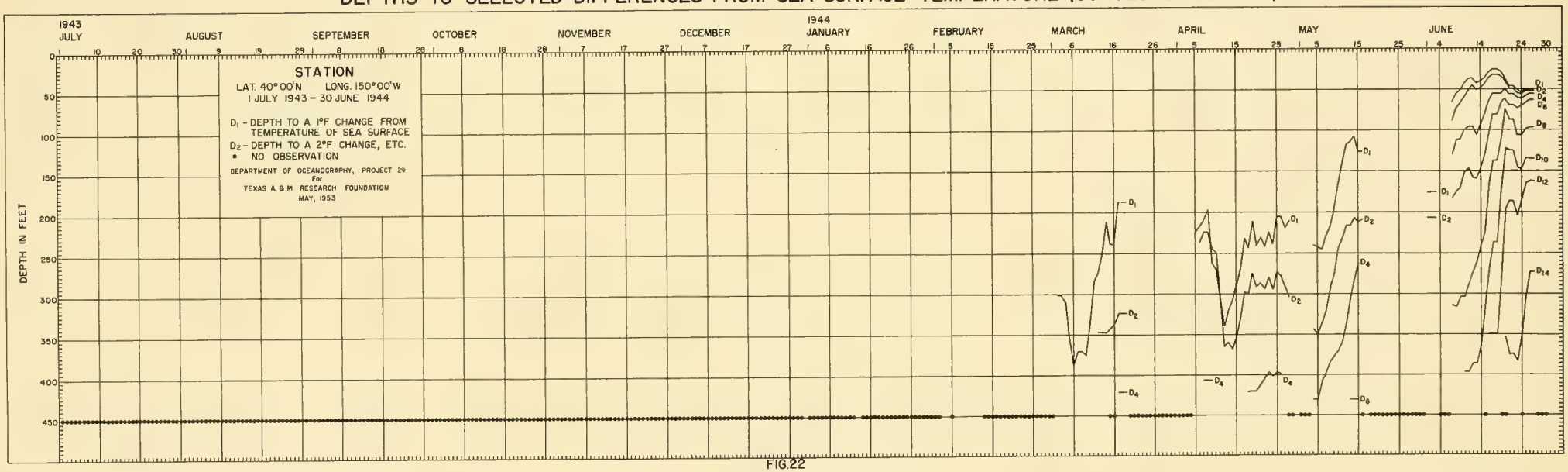



FIG.22

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

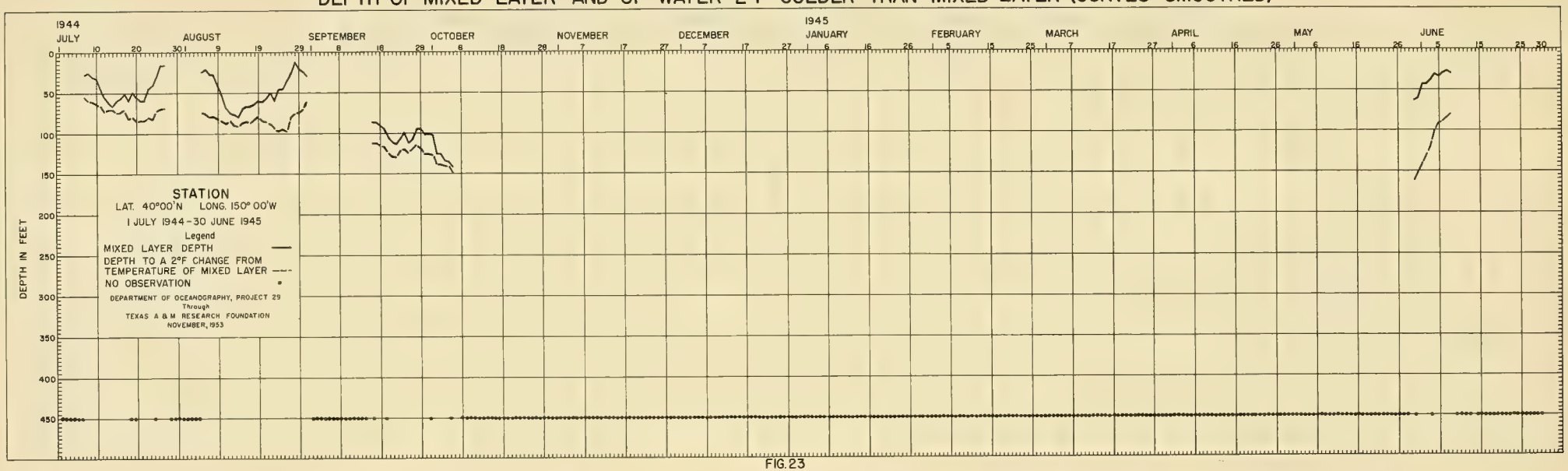



FIG. 23

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

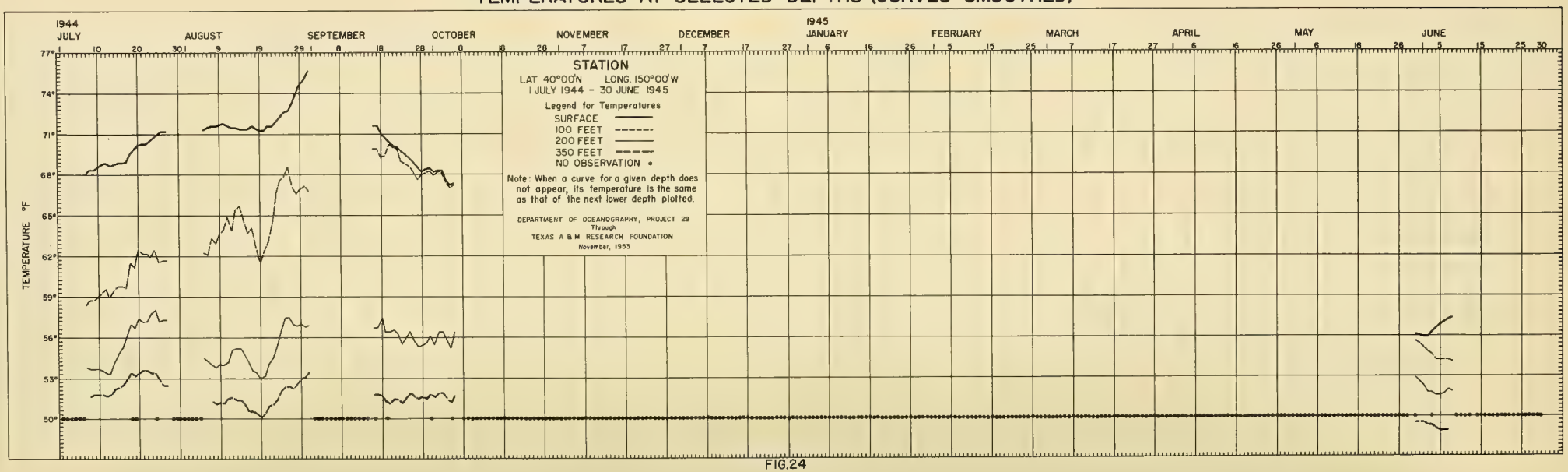



FIG. 24

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

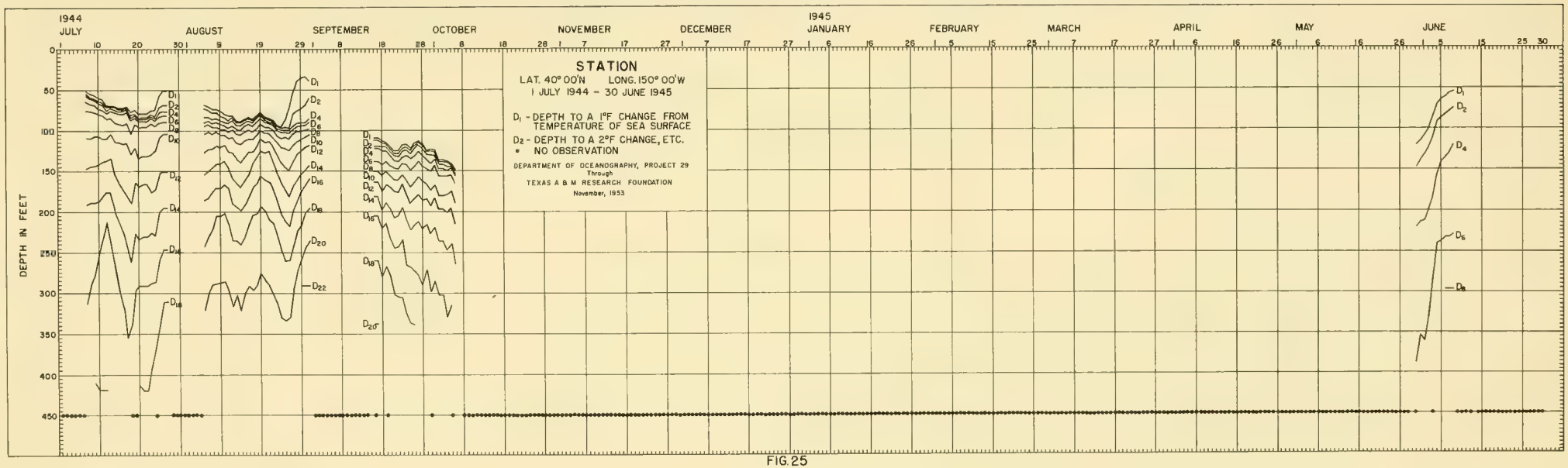



FIG. 25

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

FIG. 26

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

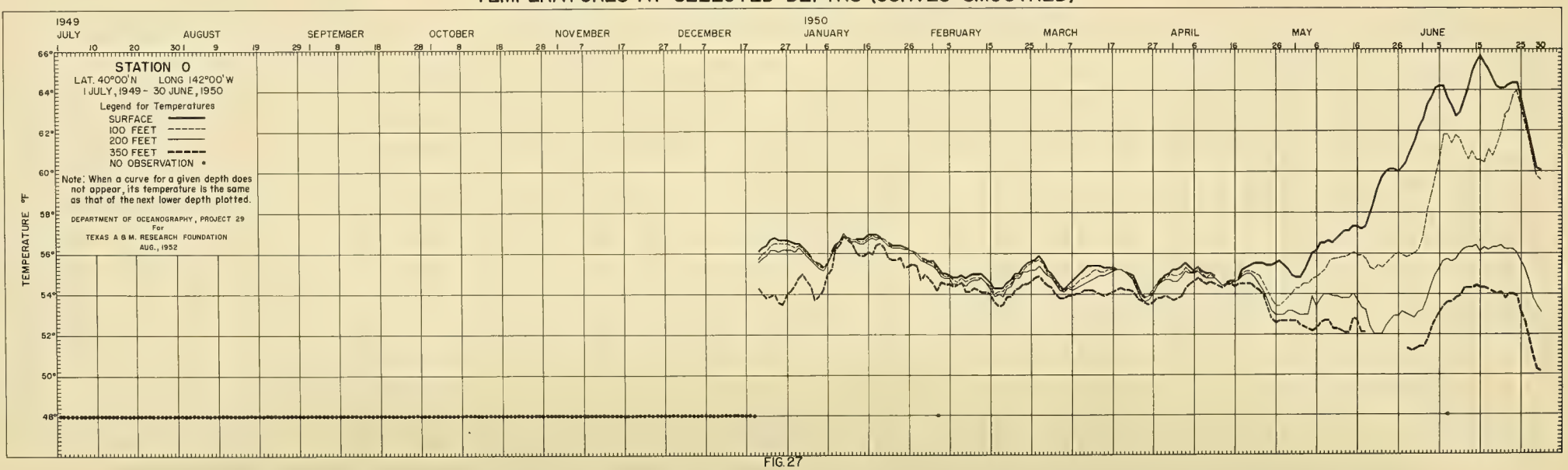



FIG. 27

DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

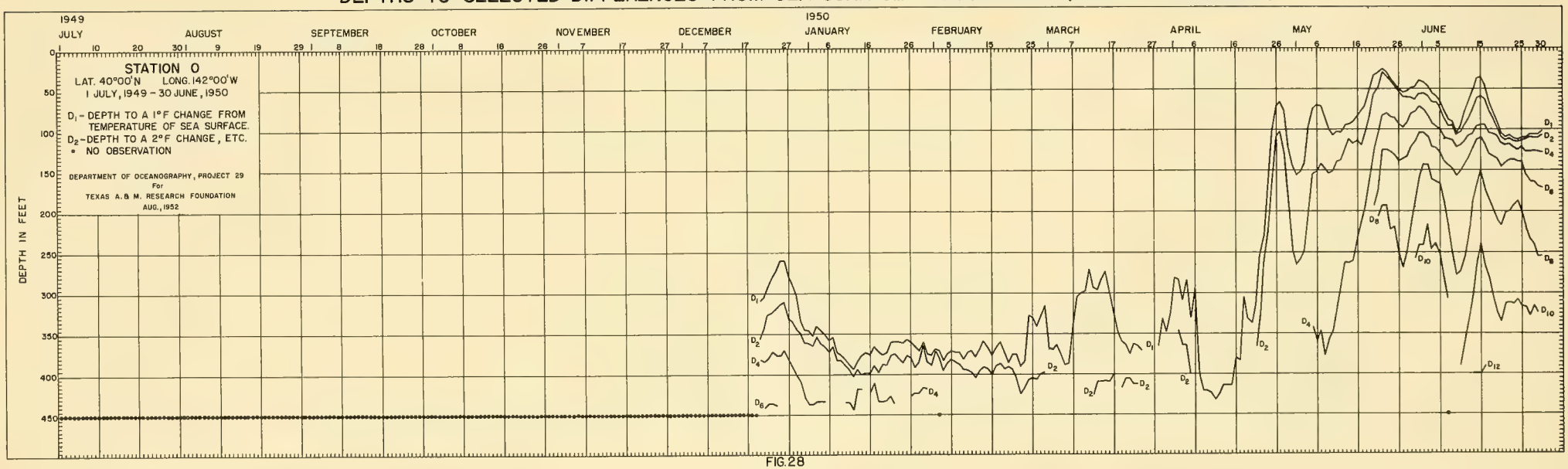



FIG. 28

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

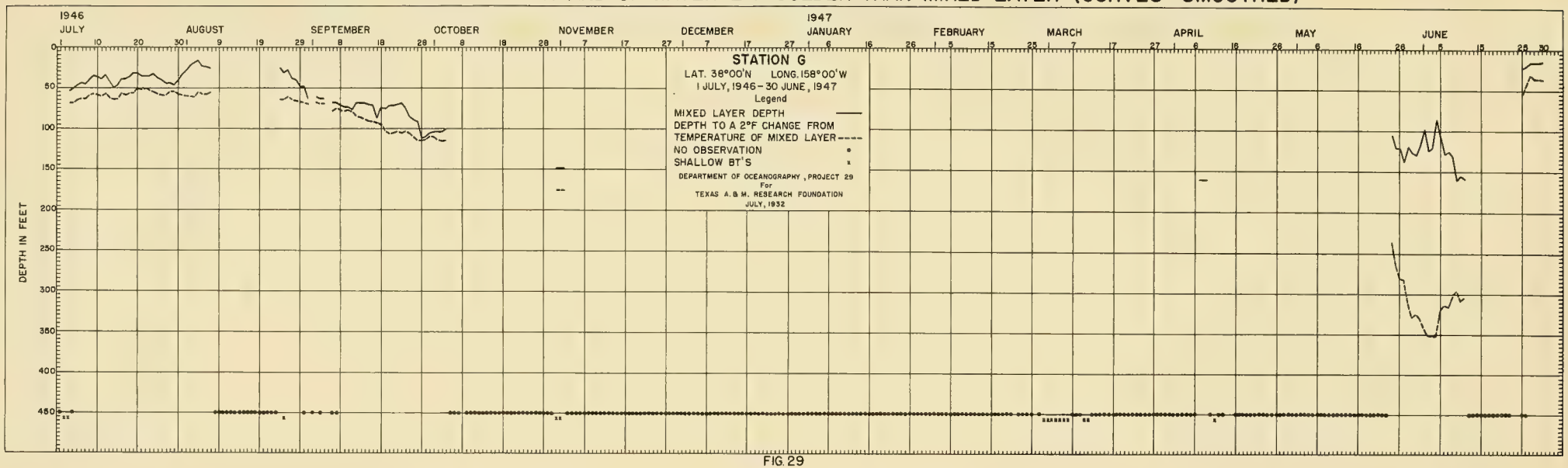



FIG. 29

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

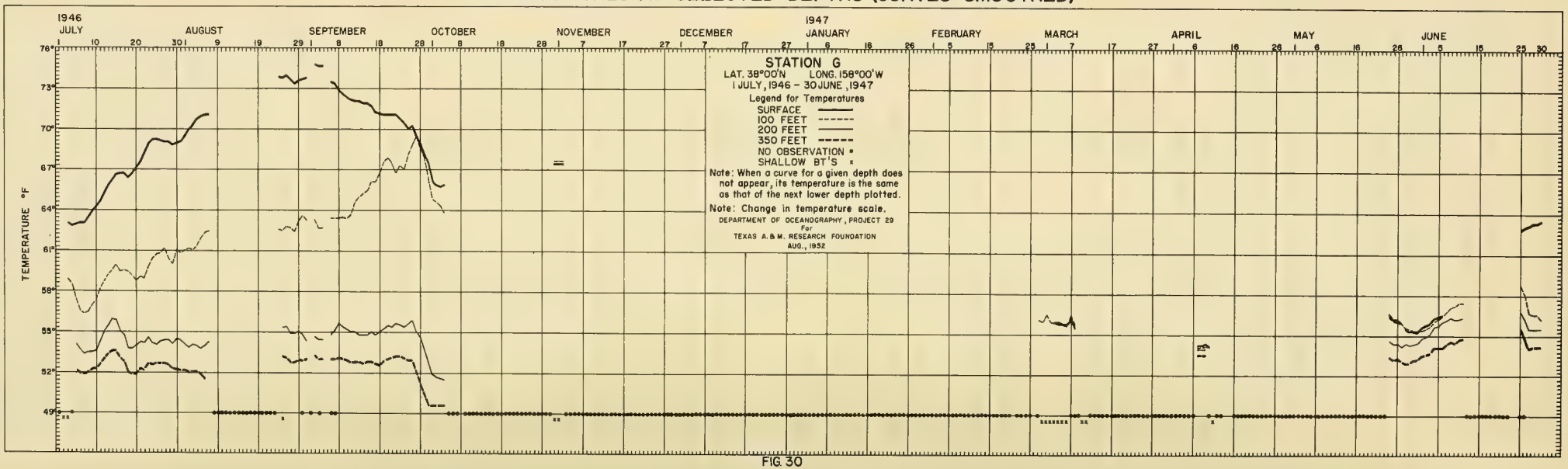



FIG. 30

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

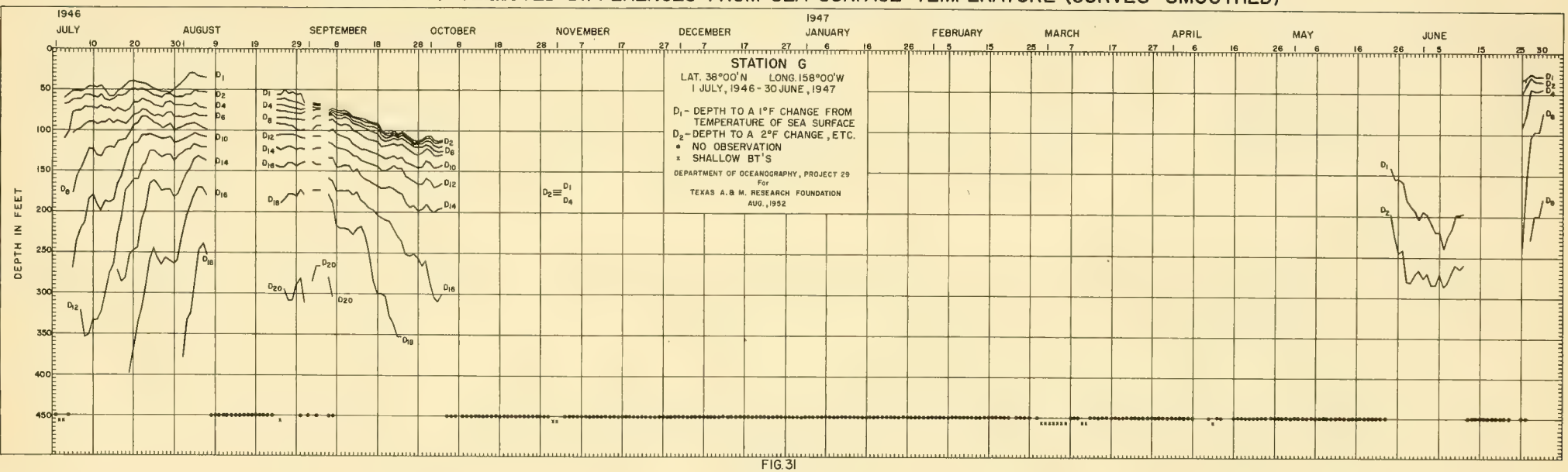



FIG. 31

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

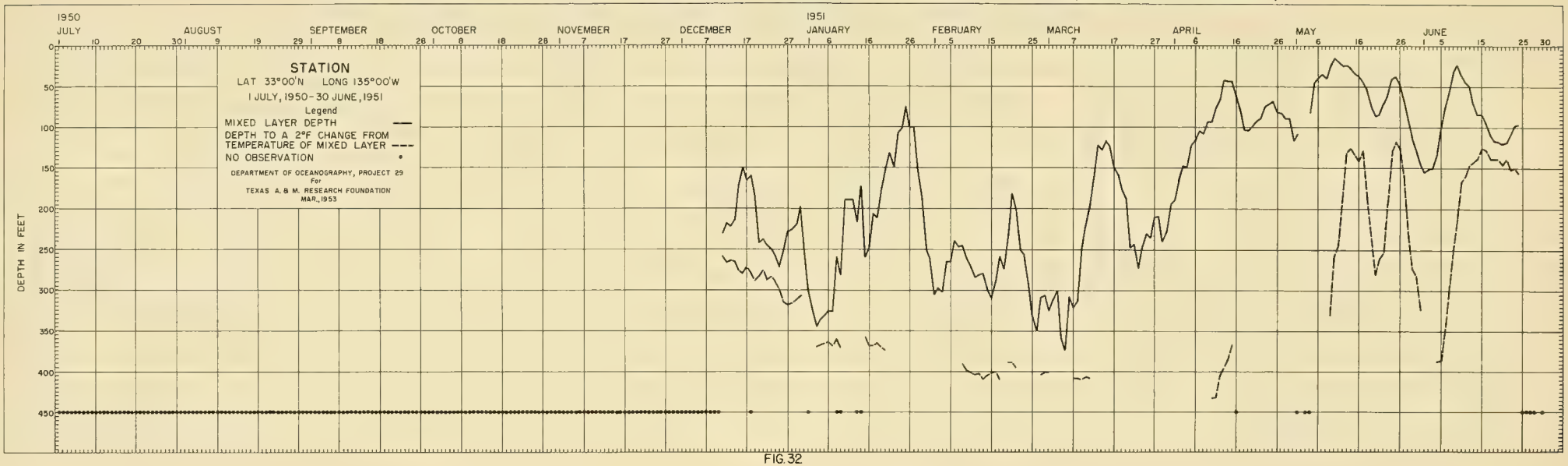



FIG. 32

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

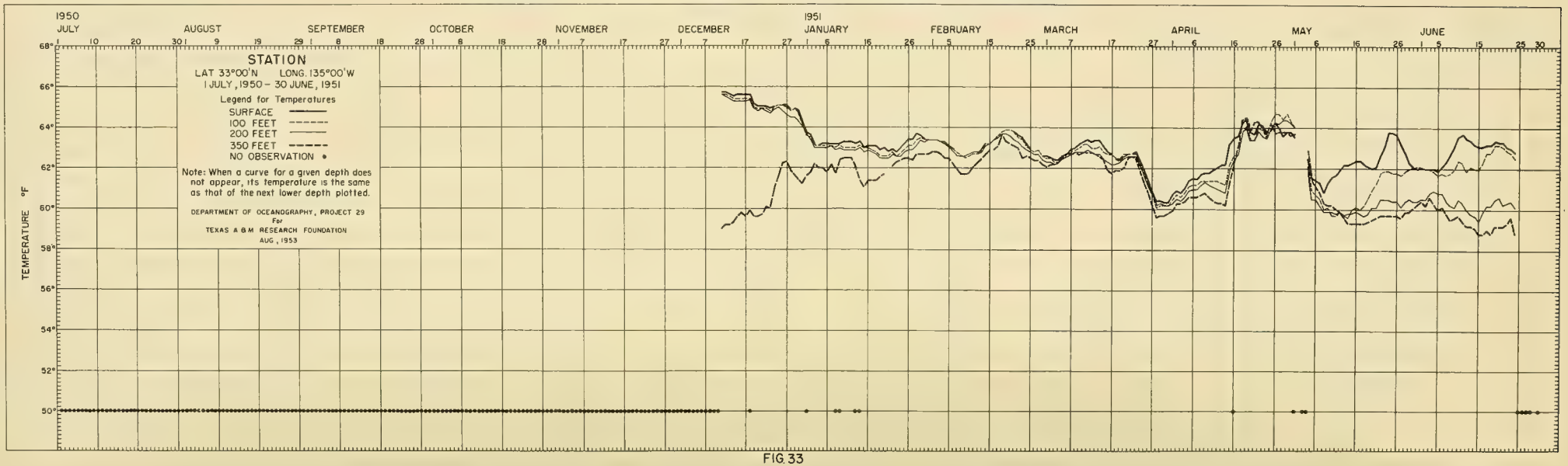



FIG. 33

DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

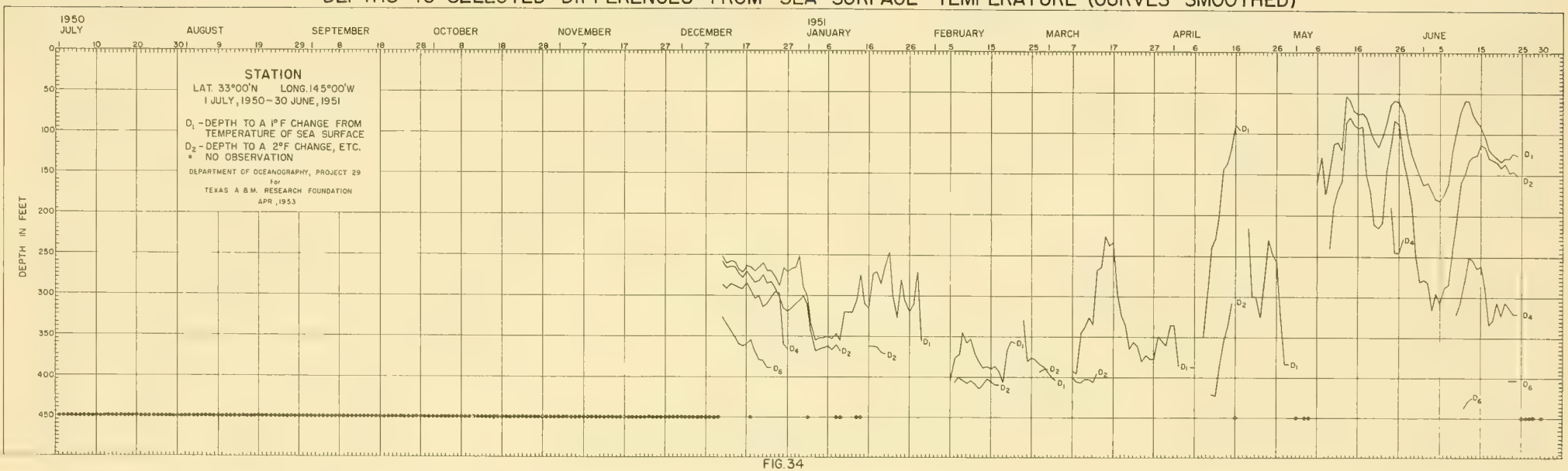



FIG. 34

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

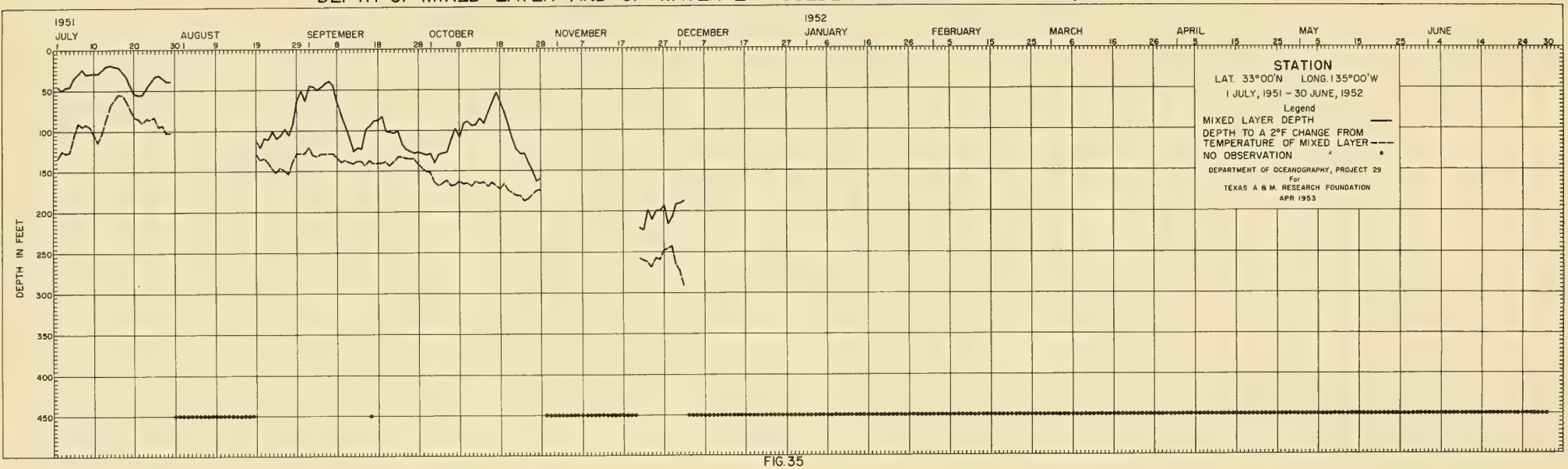



FIG. 35

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

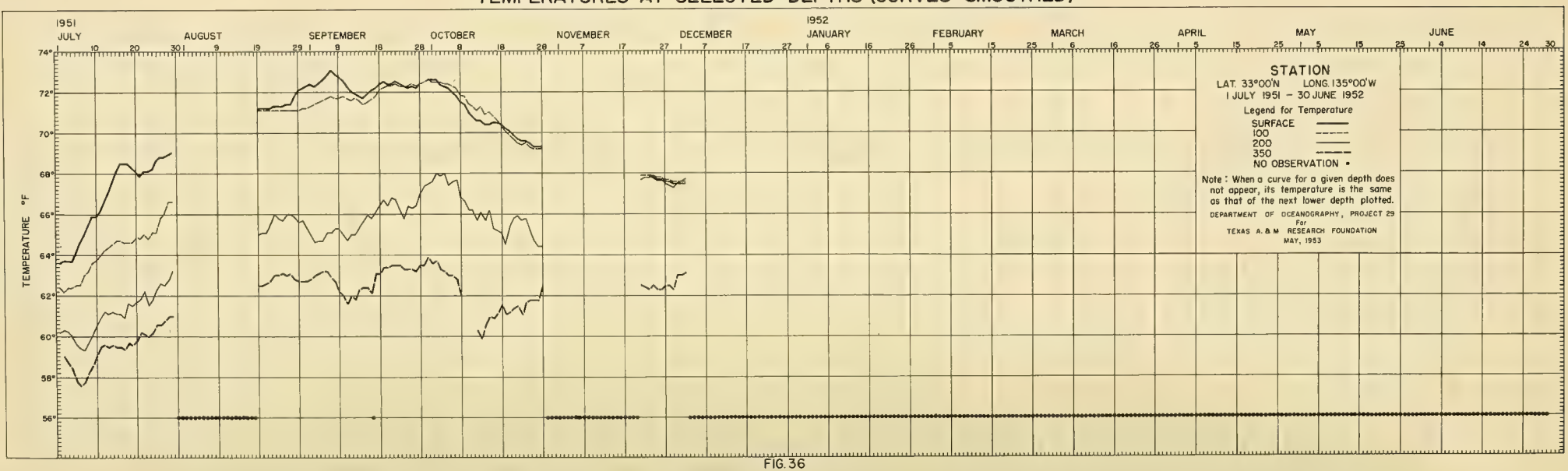



FIG. 36

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

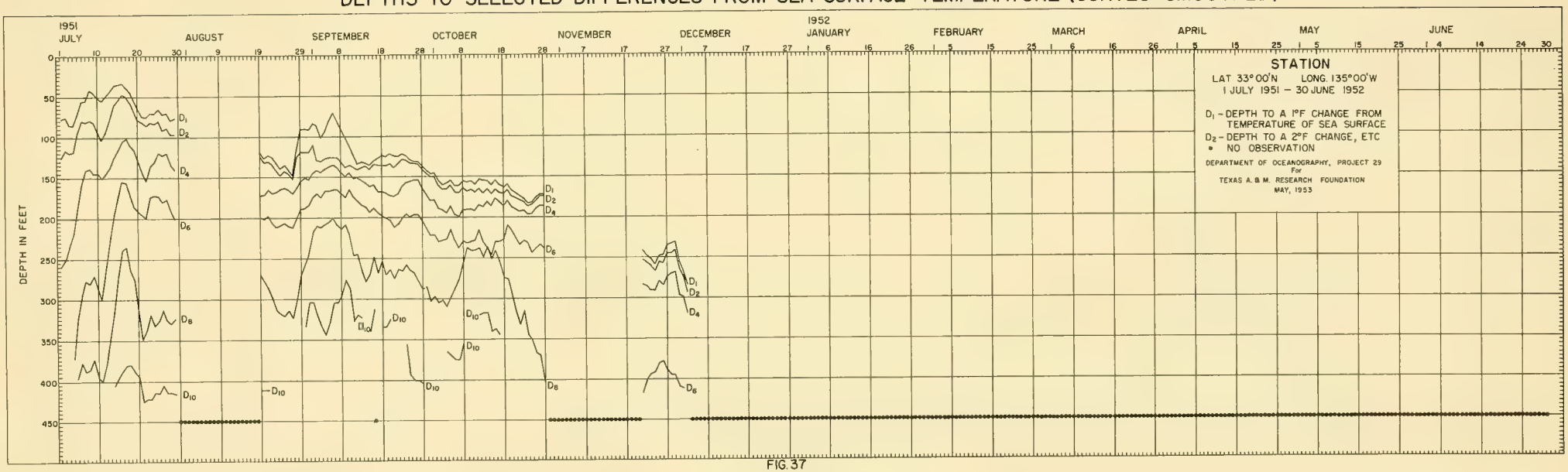



FIG. 37

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

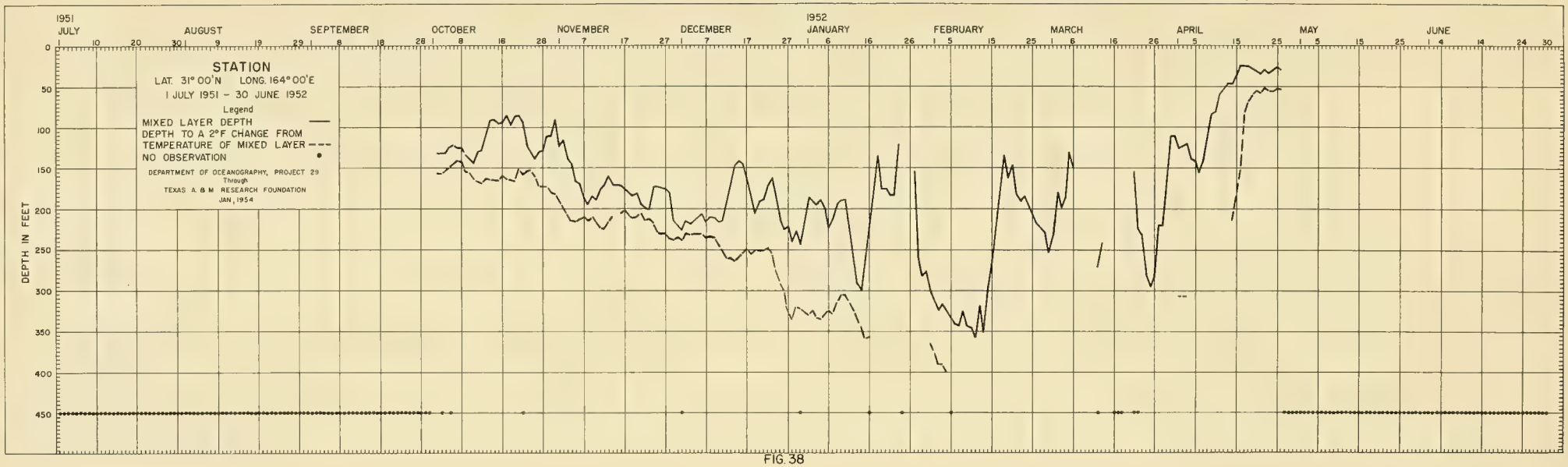



FIG. 38

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

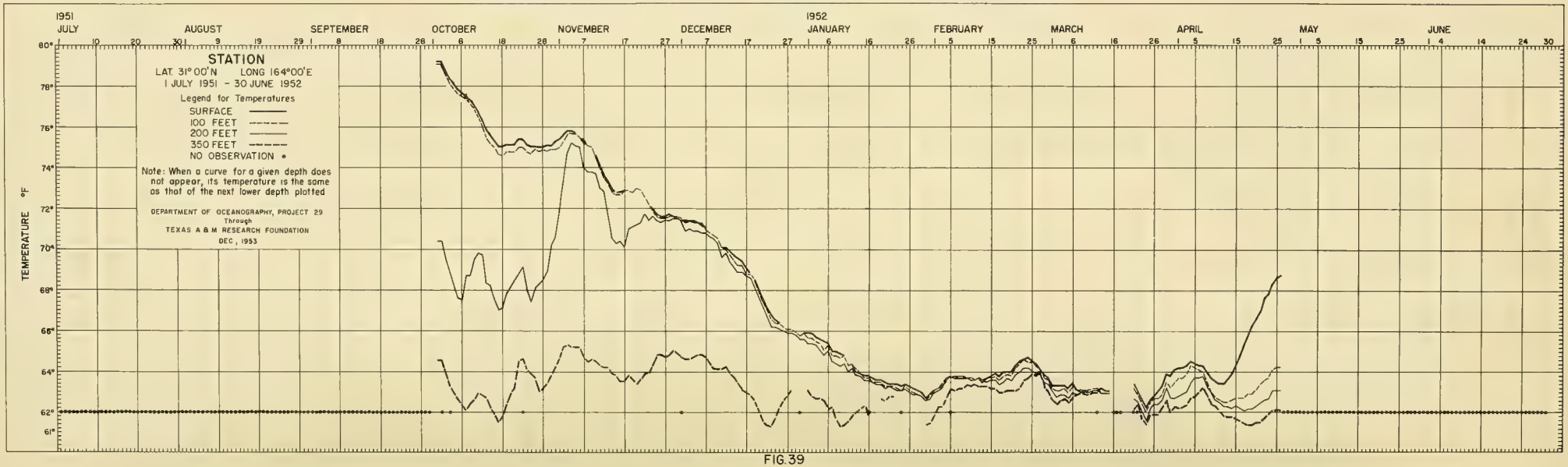



FIG. 39

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

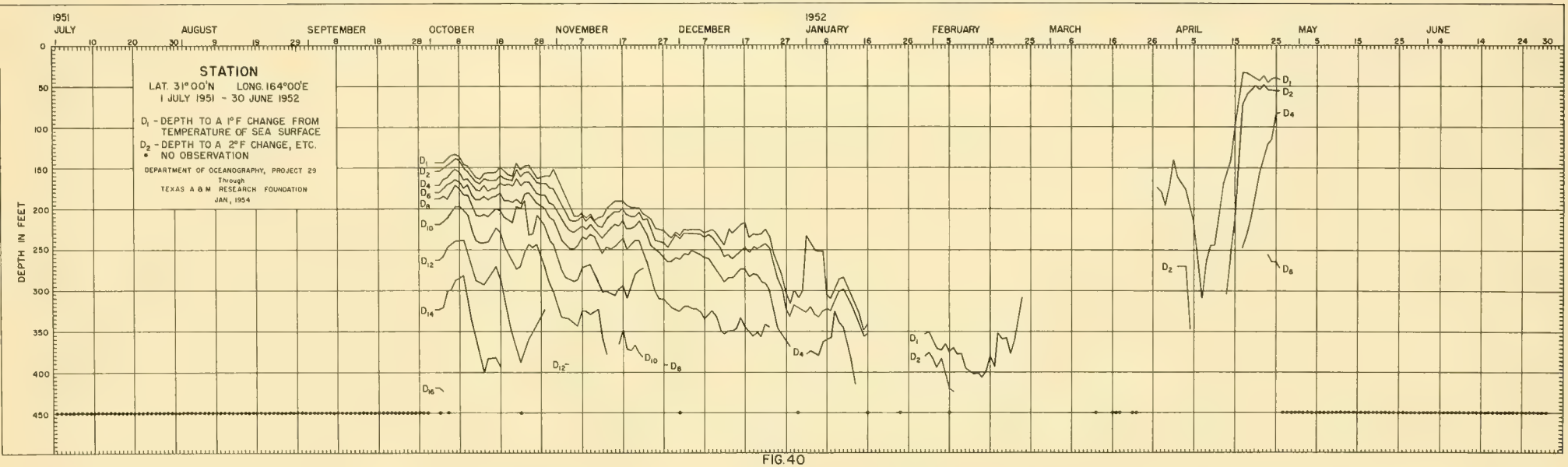



FIG. 40

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

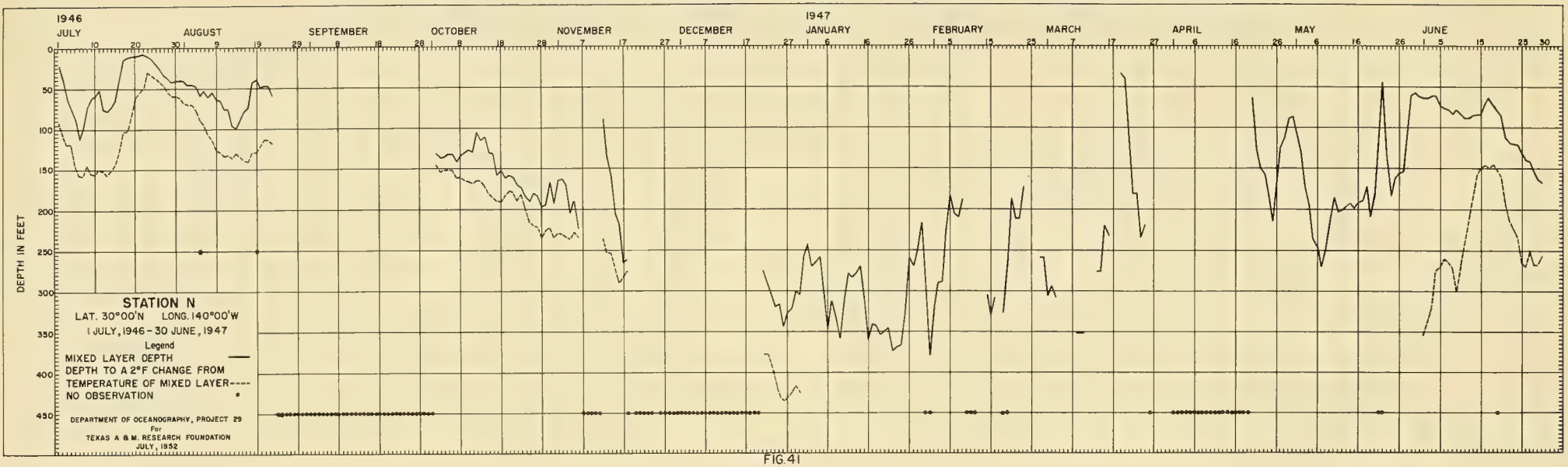



FIG. 41

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

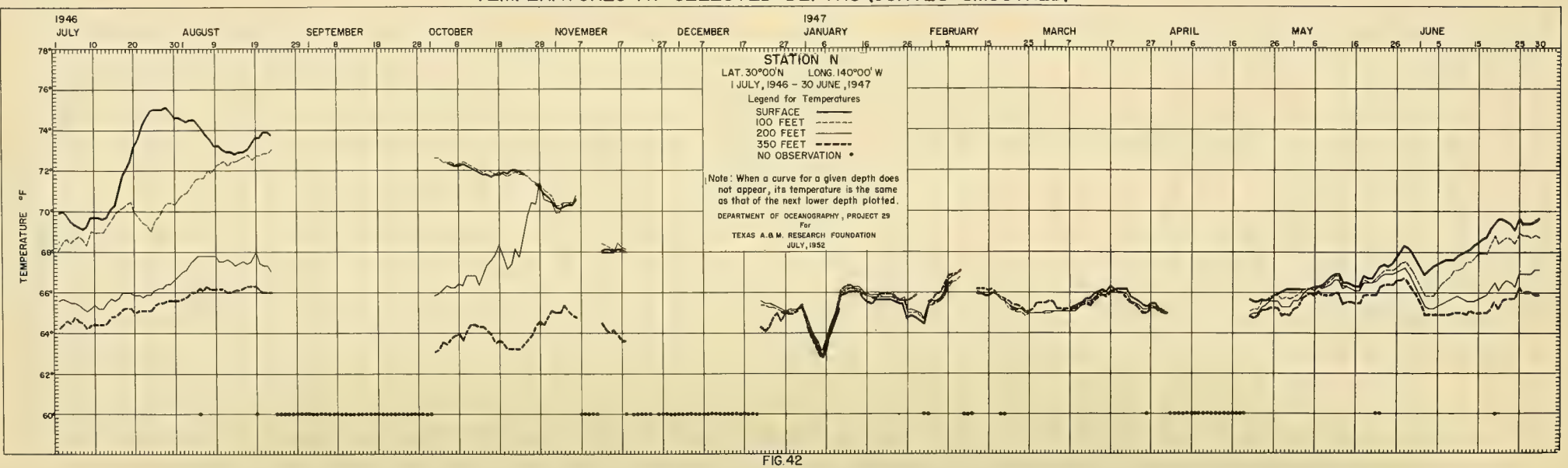



FIG. 42

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

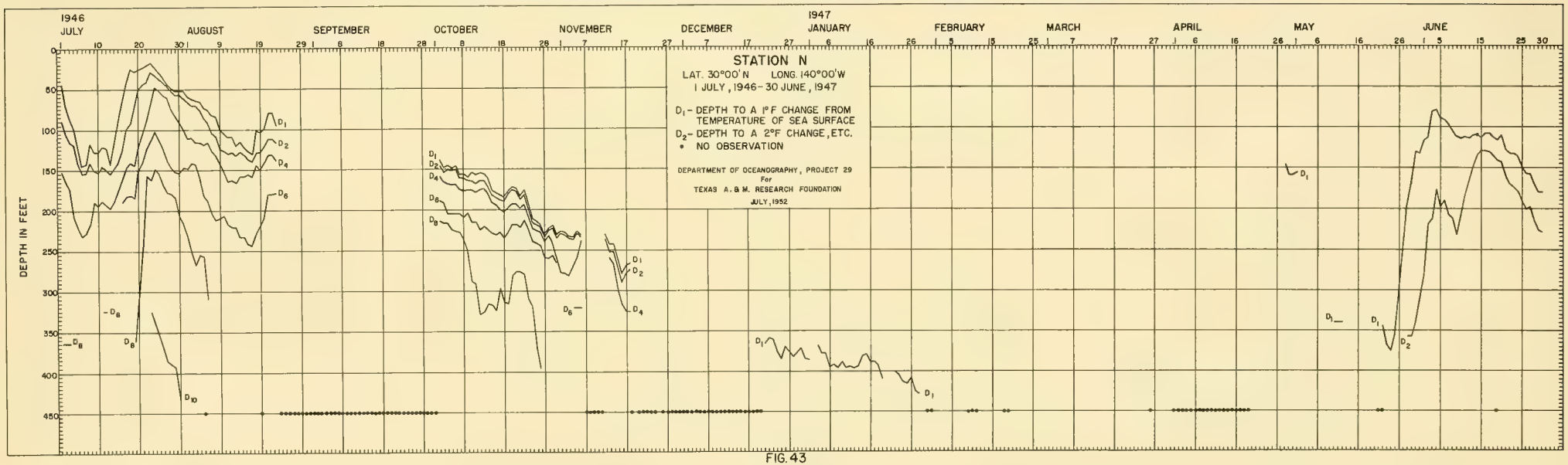



FIG. 43

## DEPTH OF MIXED LAYER AND OF WATER 2° F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

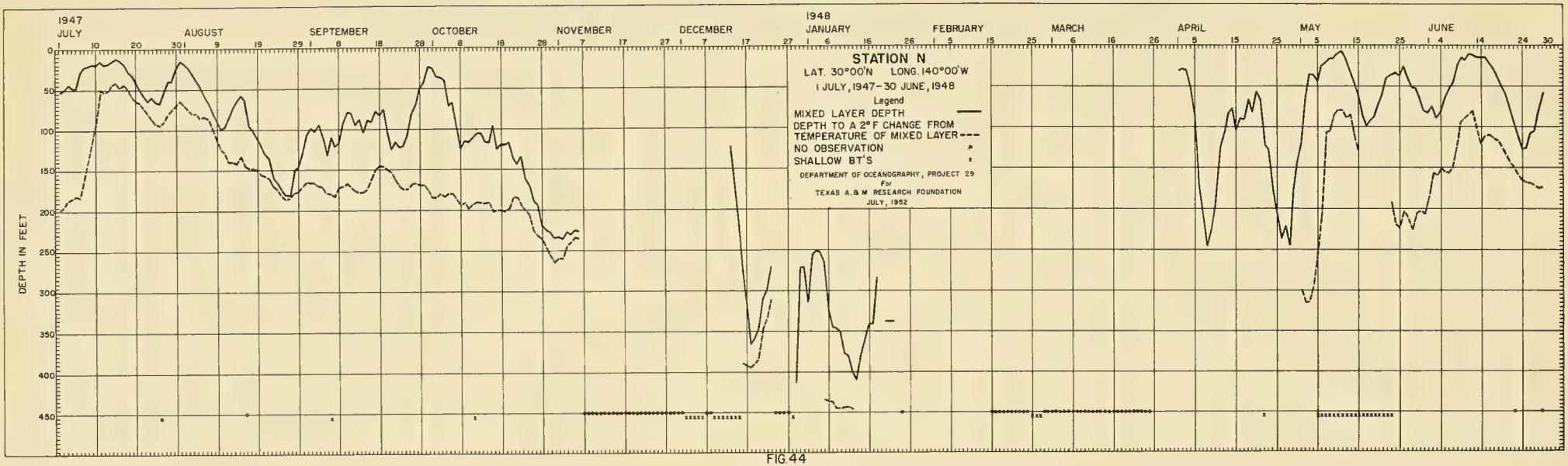



FIG. 44

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

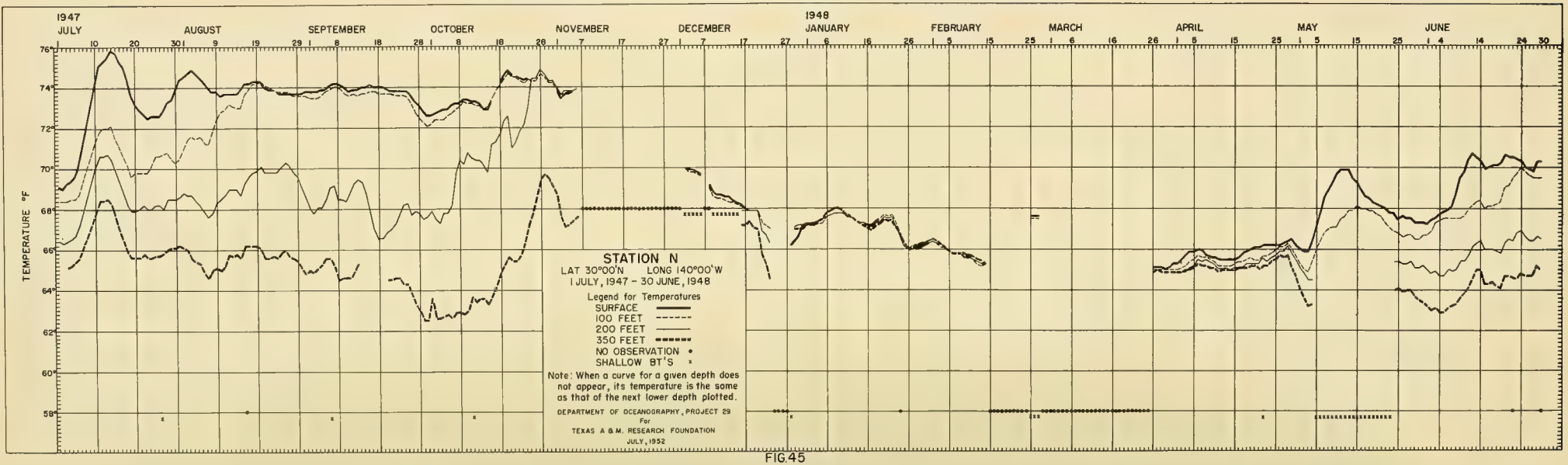



FIG. 45

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

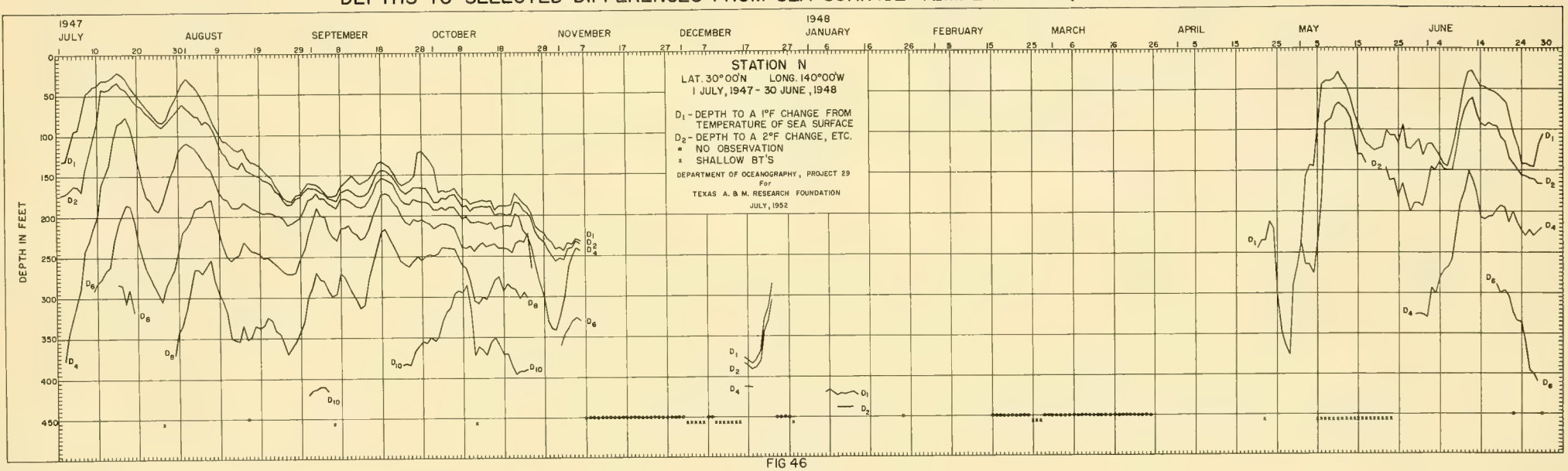



FIG 46

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

FIG. 47

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

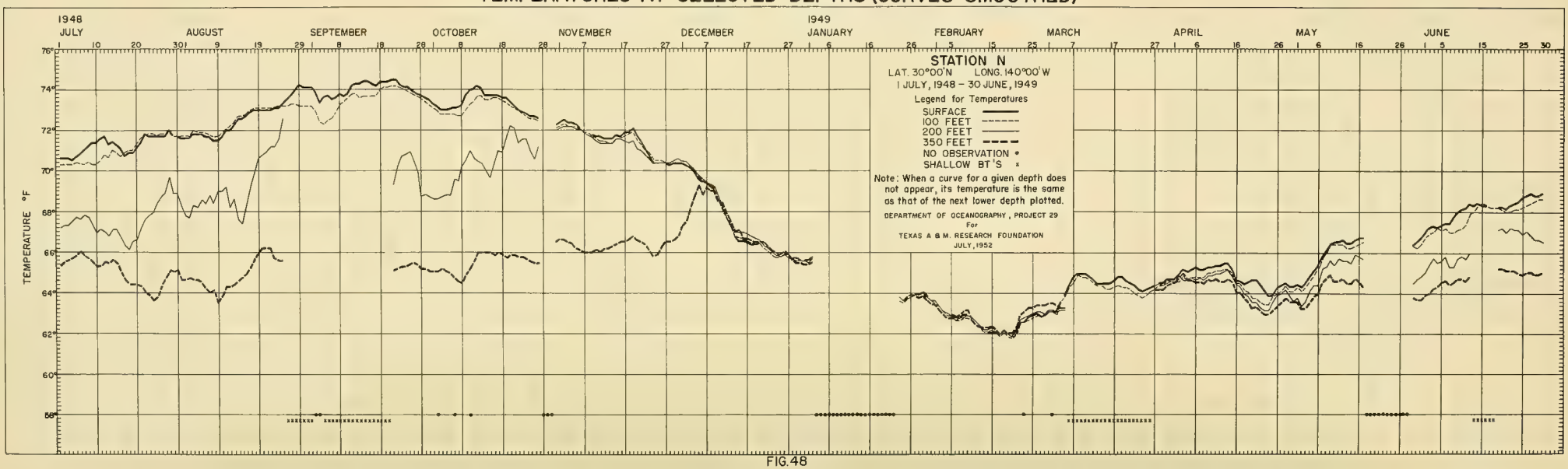



FIG. 48

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

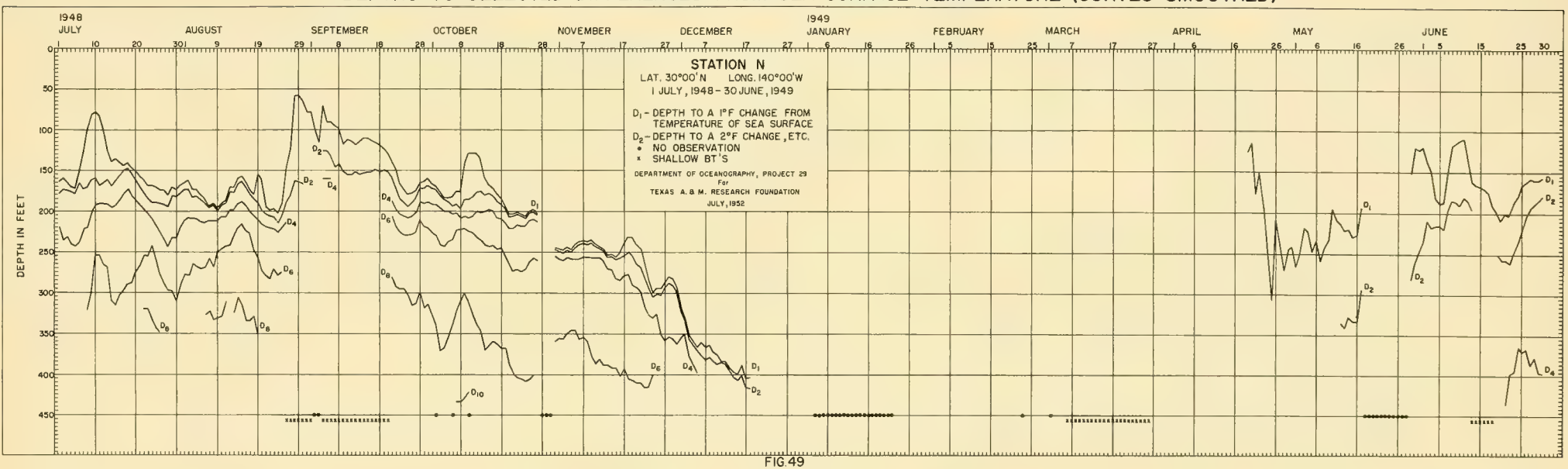



FIG.49

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

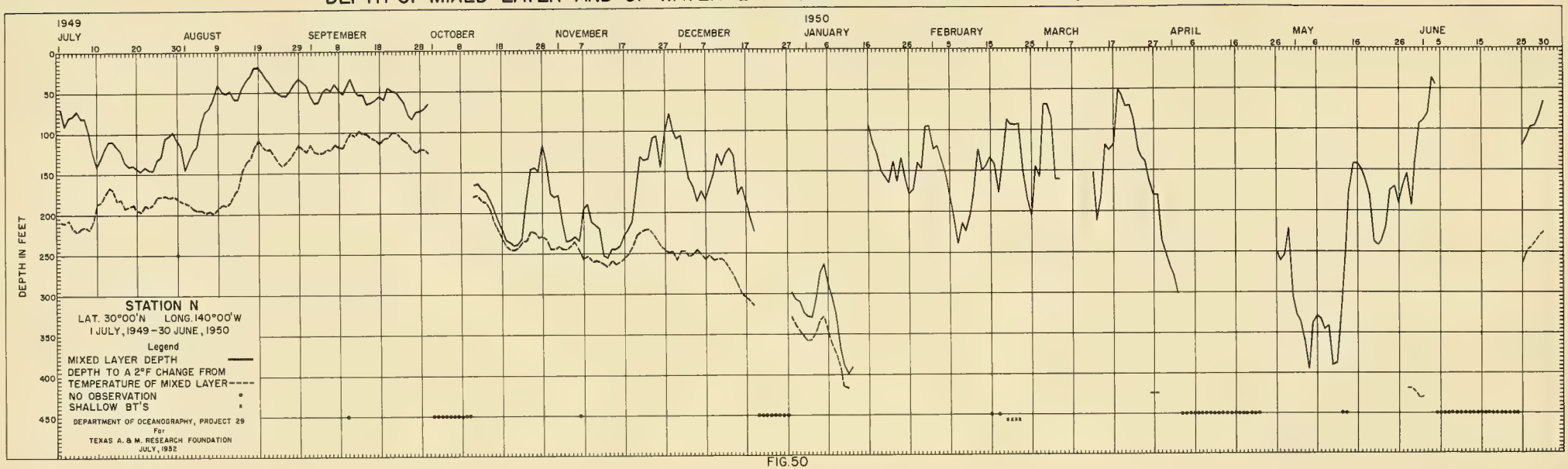



FIG. 50

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

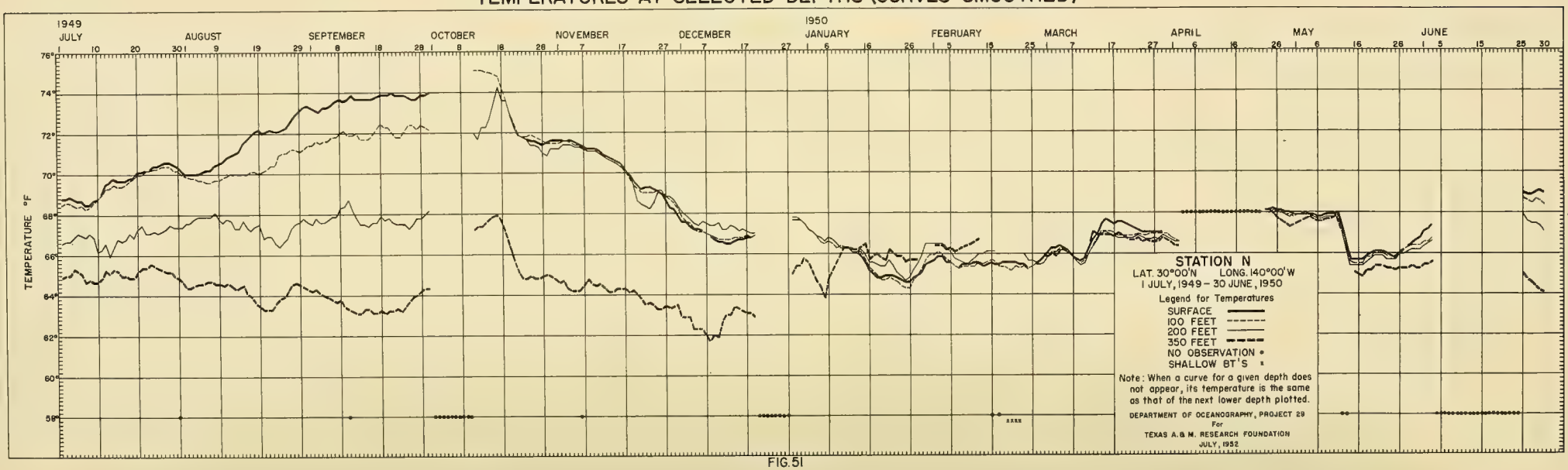



FIG. 51

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

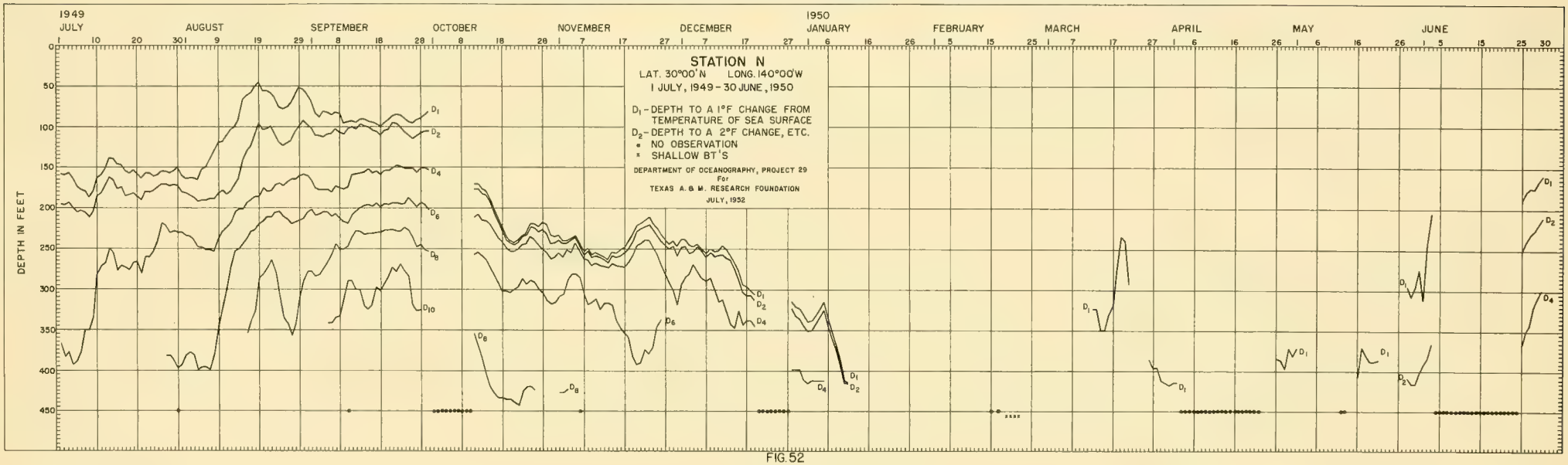



FIG. 52

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

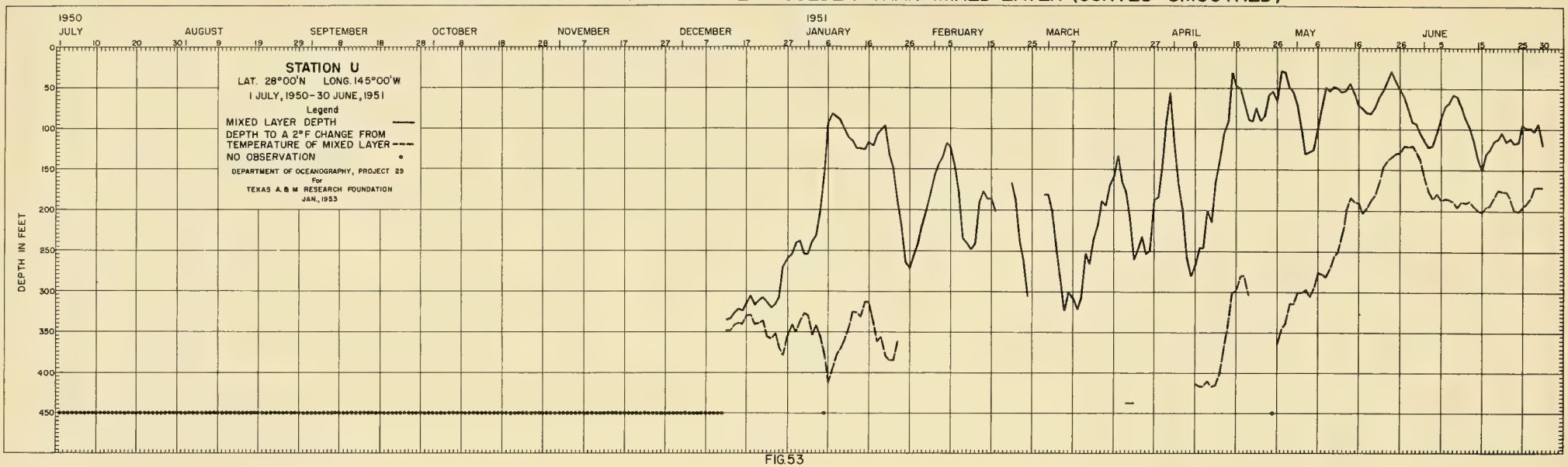



FIG.53

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

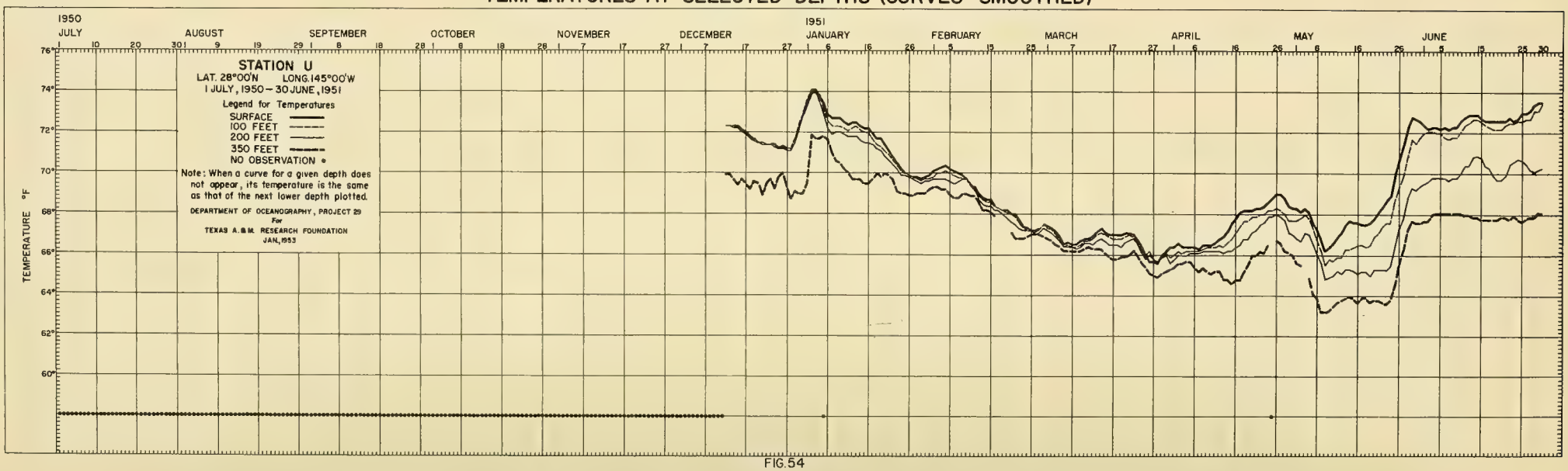



FIG.54

DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

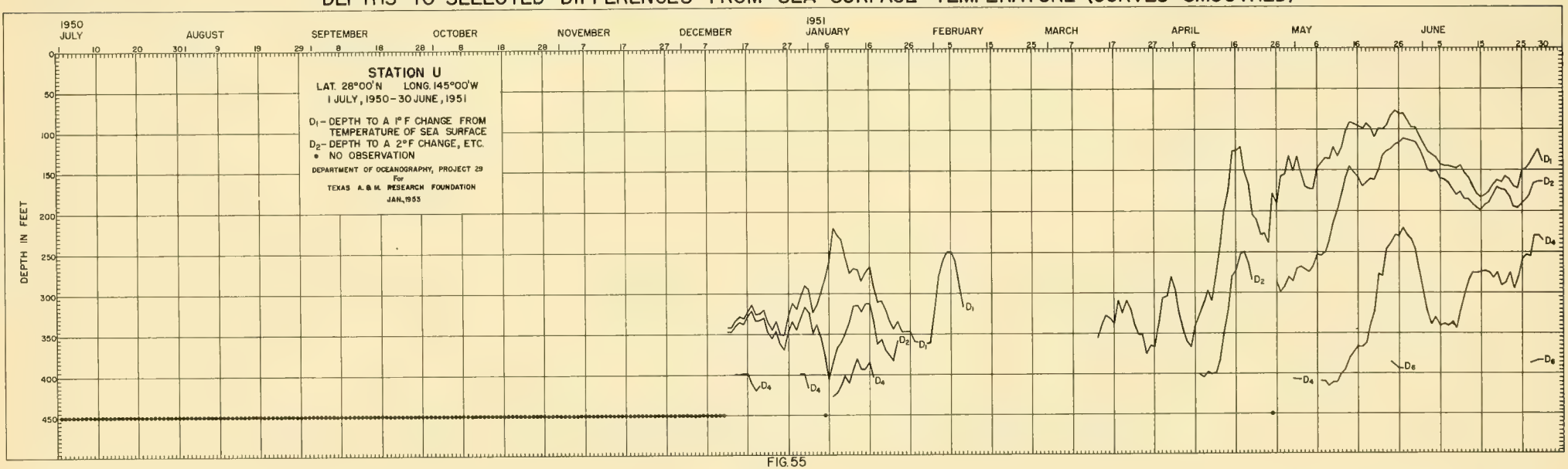



FIG. 55

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

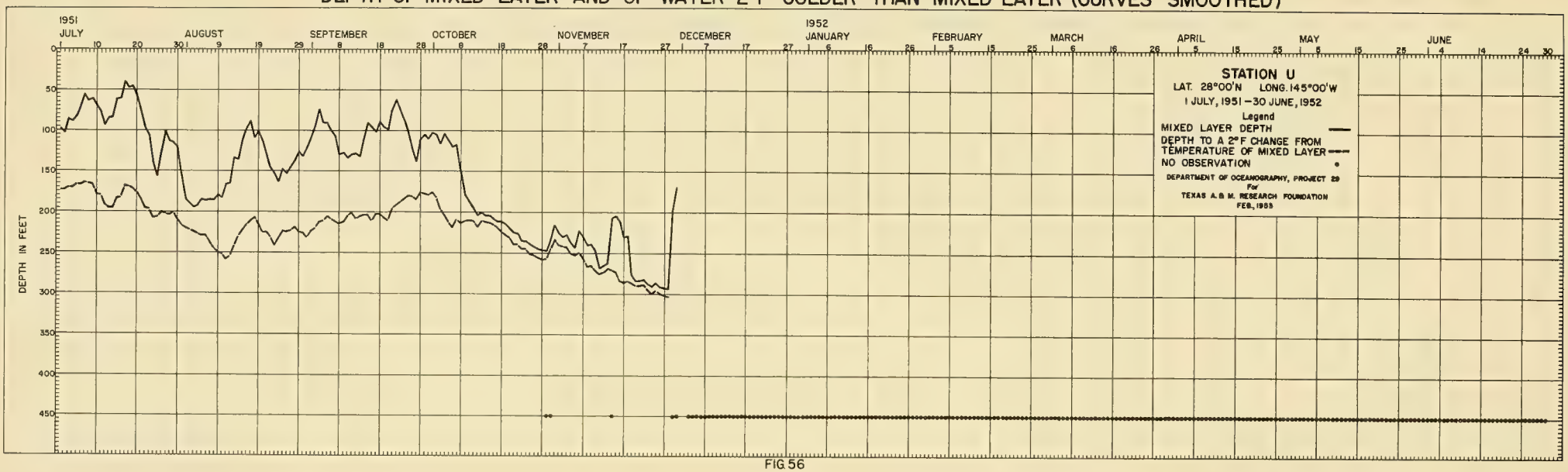



FIG. 56

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

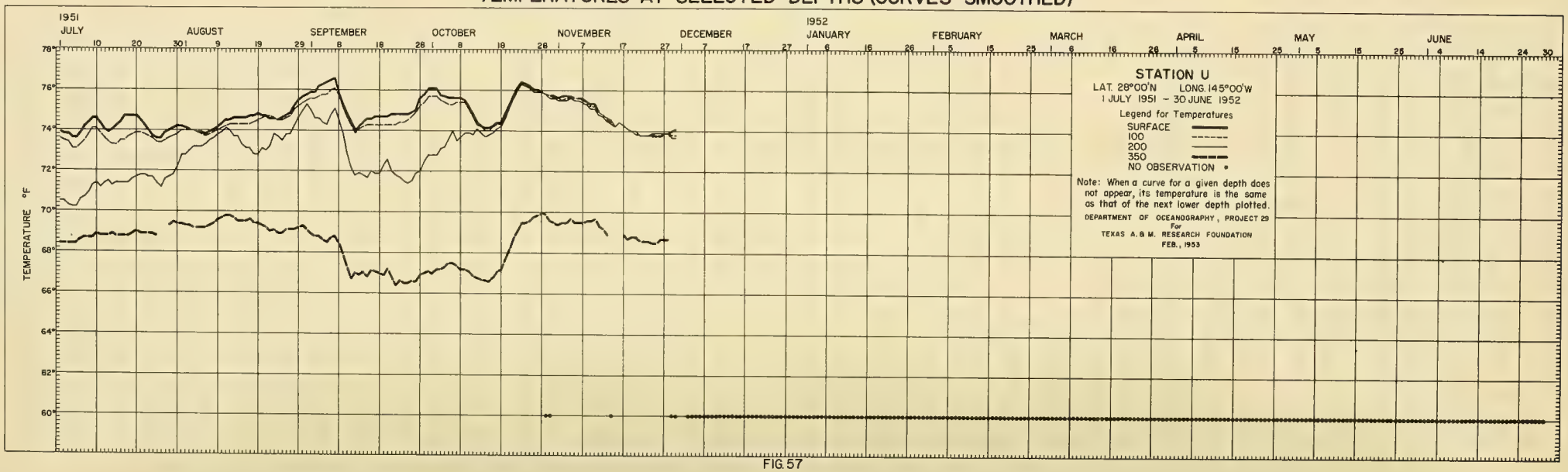



FIG. 57

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

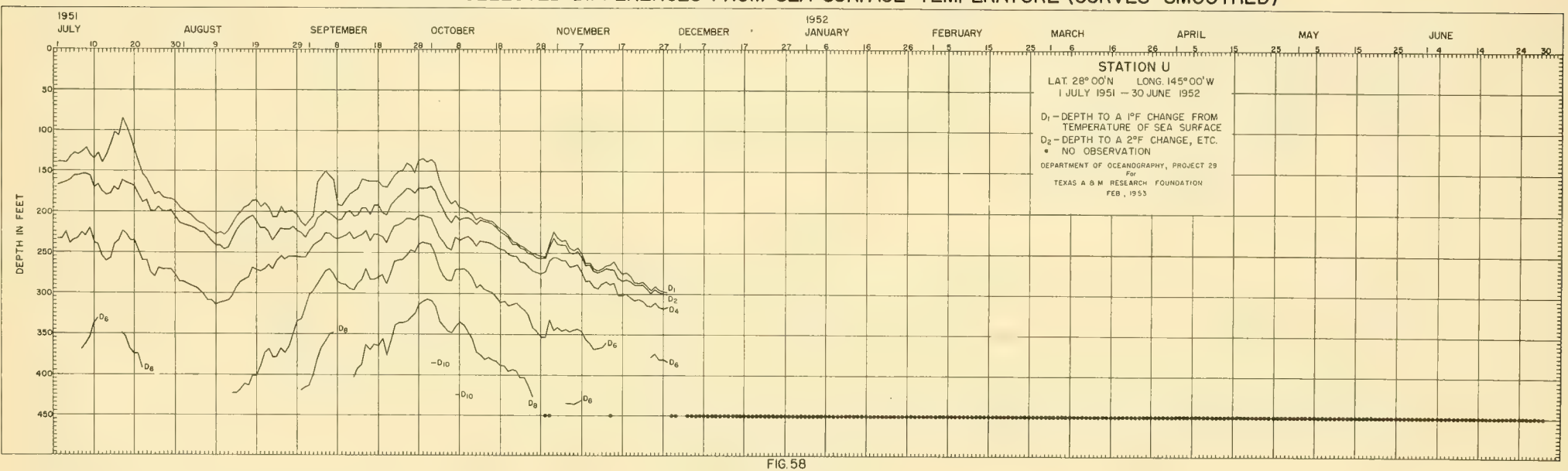



FIG. 58

## DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

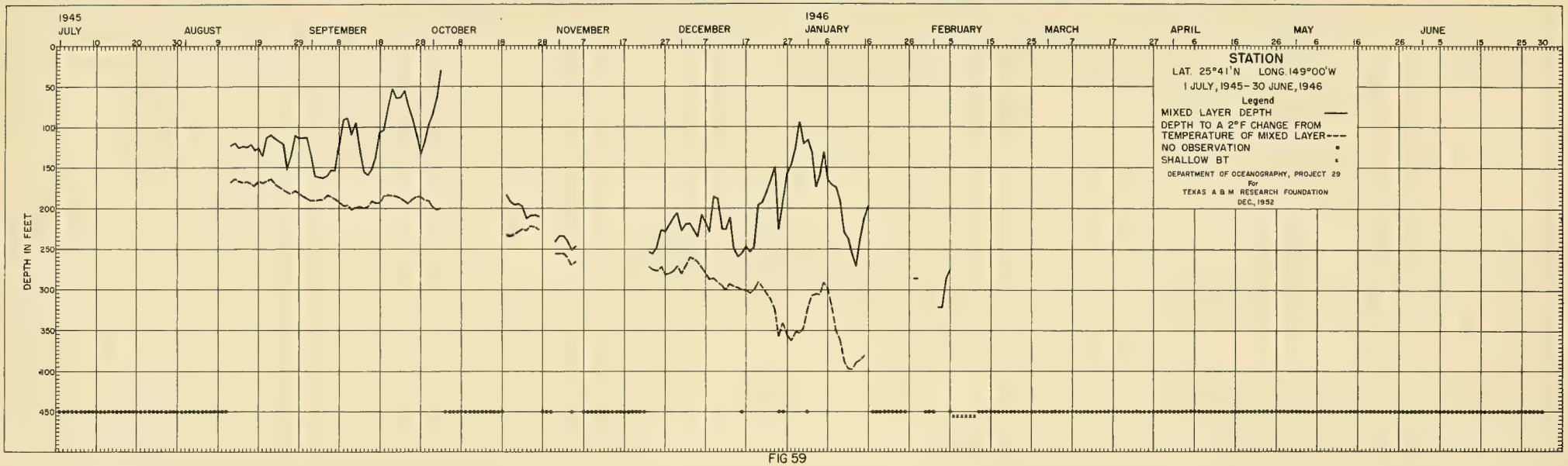



FIG 59

## TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

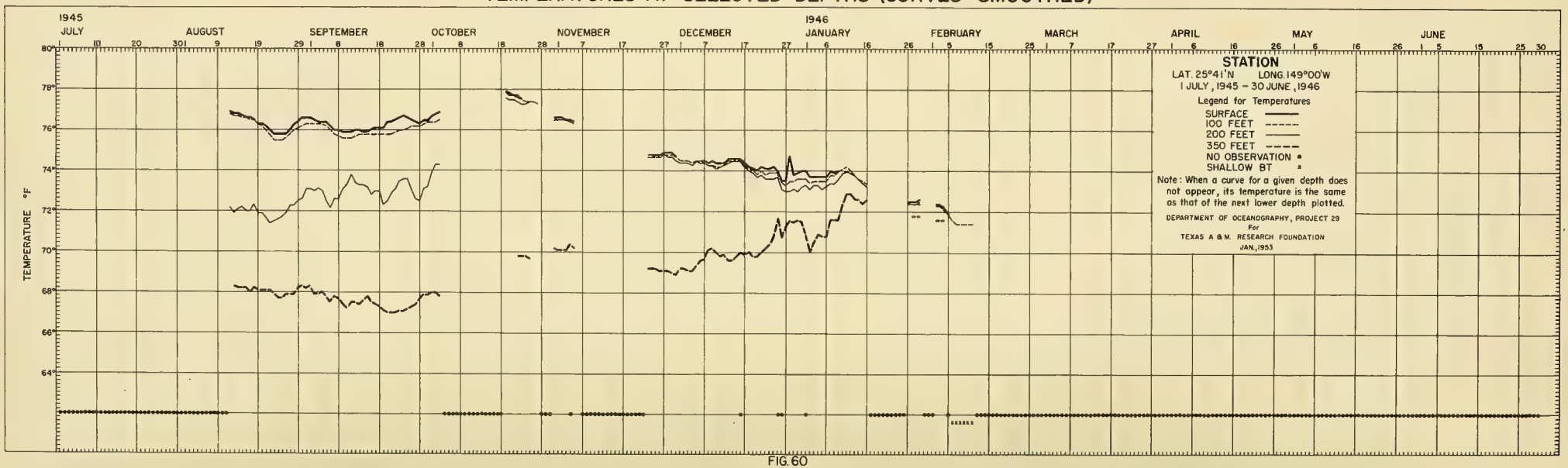



FIG. 60

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

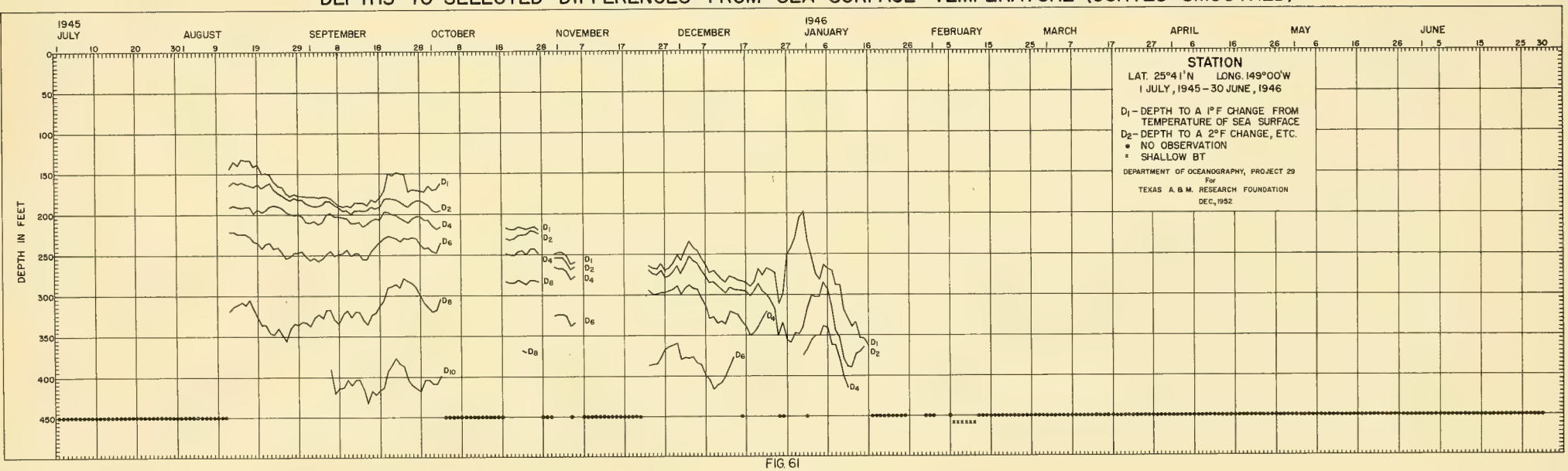



FIG. 61

## DEPTH OF MIXED LAYER AND OF WATER 2° F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

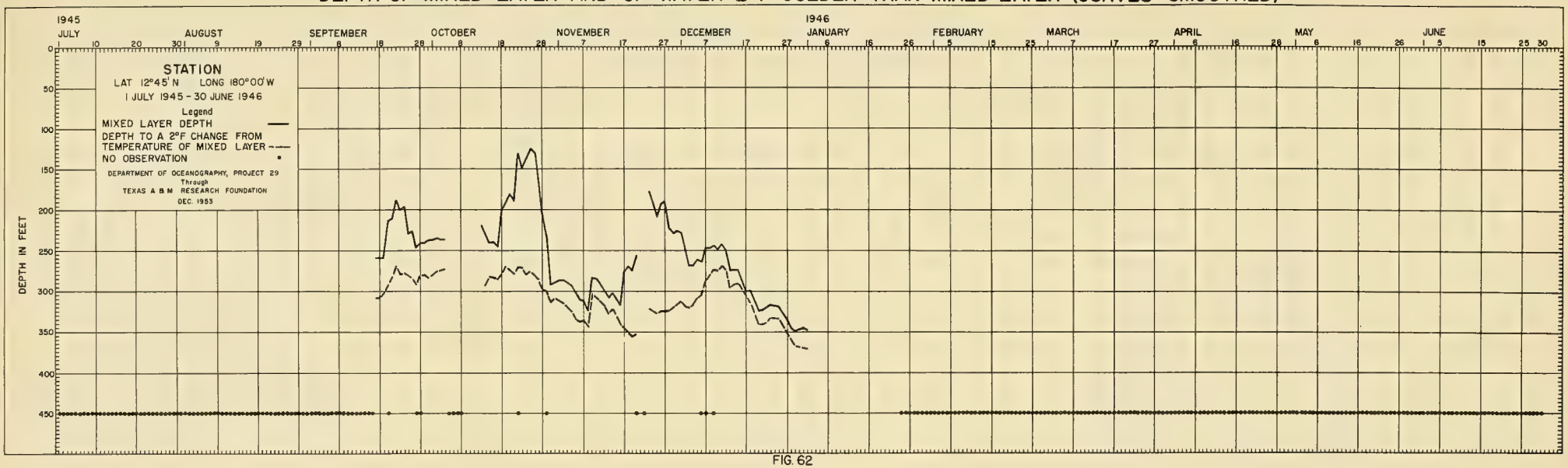



FIG. 62

## TEMPERATURE AT SELECTED DEPTHS (CURVES SMOOTHED)

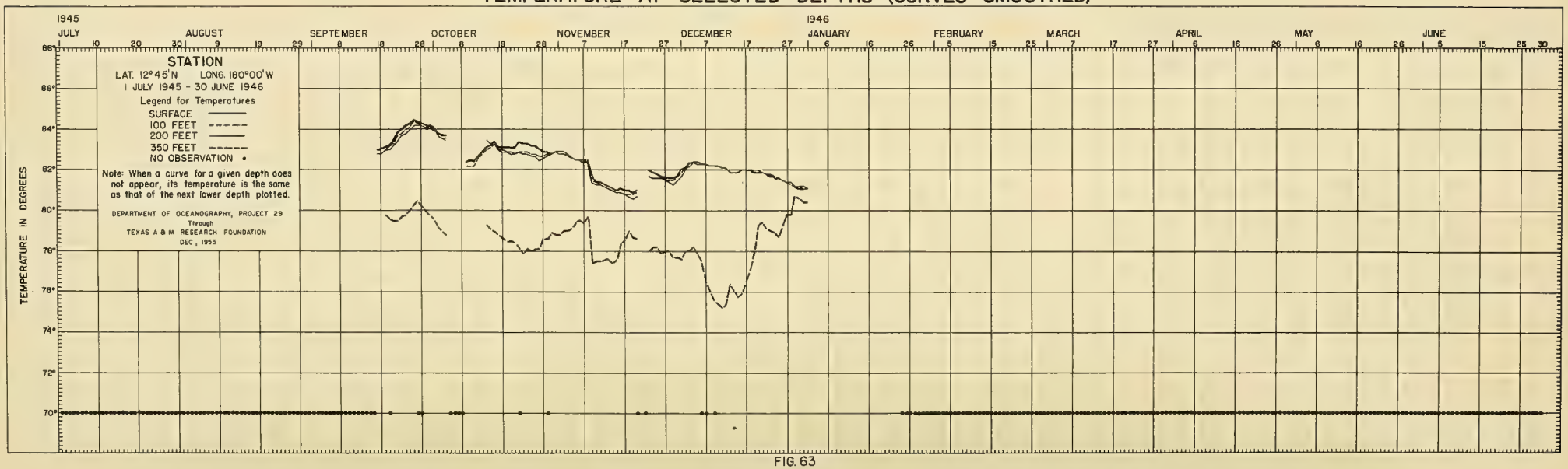



FIG. 63

# DEPTH TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

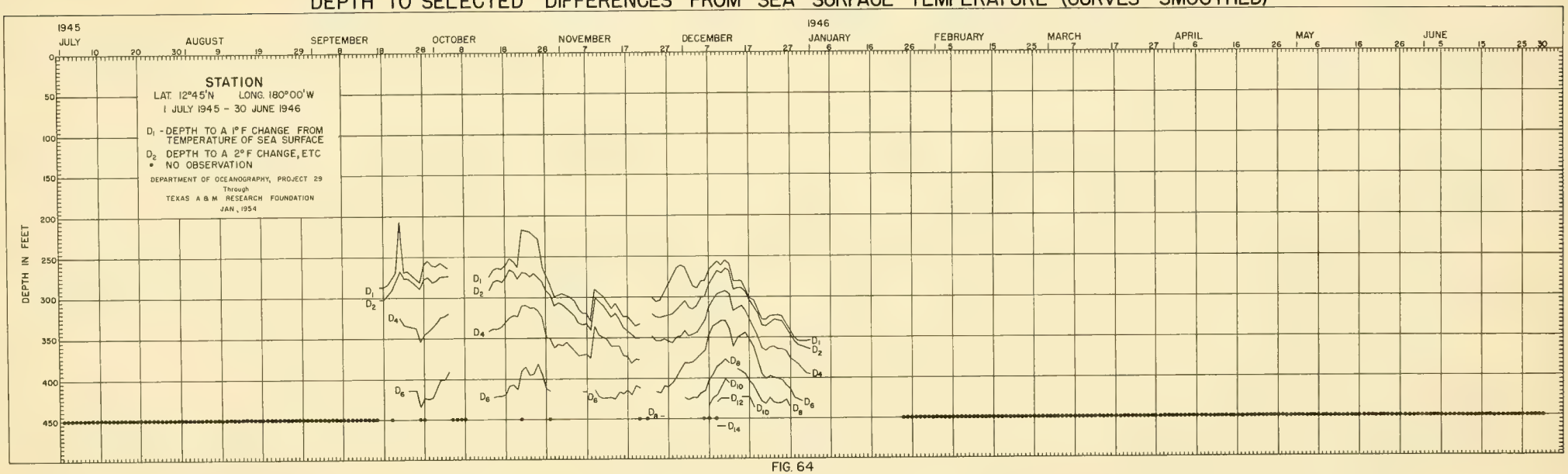



FIG. 64

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